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Improving maritime community communication through information communication technology : a feasibility case study at the Myanmar Maritime University

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IMPROVING MARITIME COMMUNITY COMMUNICATION THROUGH INFORMATION COMMUNICATION TECHNOLOGY
A Feasibility Case Study at the Myanmar Maritime University

By

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

Title of dissertation: **Improving Maritime Community Communication through Information Communication Technology – A Feasibility Case Study at the Myanmar Maritime University**

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Increasingly, Information Communication Technology (ICT) is an important component for the global maritime industries and maritime educational institutes that presents both new opportunities and challenges. The main question addressed within this study is how MET institutions may use the possibilities arising from new ICT technologies to support communication and collaboration with private and public organizations to support education and training.

One case that targets the feasibility of constructing a virtual community to support a scholarship program by using ICT is explored. For investigation, the notion of knowledge clusters is used to position how a MET institution may interact with a particular segment of industry. In addition, a technical web-site prototype is designed to illustrate how it is practically possible to change the current way of operation. Finally, it is evaluated how ICT may strengthen the interaction of the actors within the maritime knowledge cluster; the importance of including both social and technical consideration in the design of ICT; and the capabilities of fourth generation technical platforms - that are used for the technical design within this study.

KEYWORDS: Information Communication Technology, maritime industry, knowledge cluster, maritime education and training, scholarship process.

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LIST OF ABBREVIATIONS

CMS	Content Management Systems
DMA	Department of Marine Administration
ICT	Information Communication Technology
IMO	International Maritime Organization
ME	Marine Engineering
MET	Maritime Education and Training
MFSL	Myanmar Five Stars Shipping Line
MMU	Myanmar Maritime University
MOA	Memorandum of Agreement
MOT	Ministry of Transport
NS	Nautical Science
SECD	Seamen Employment Control Division
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended
UNCTAD	United Nation Conference on Trade and Development

Chapter 1
Introduction

Increasingly, Information Communication Technology (ICT) is an important component for the global maritime industries and maritime educational institutes that presents both new opportunities and challenges (Hersham, 2003; Constantinescu, 2003).

It can be recognized that for Maritime Education and Training (MET) Institutions, both national and international relationships have a high priority to further, for example, students' qualification development and certification training. Within a maritime community, strong interaction and collaboration with the shipping industry is therefore important to support education and training activities. Arguably especially for a developing country, this is of essence to improve the national maritime competency base. The main question addressed within this study is how MET institutions may use the possibilities arising from new ICT technologies to support communication and collaboration with private and public organizations to support education and training?

The objective is to further the understanding of how MET institutions can utilize ICT to improve working communication and collaboration within a maritime community to improve education and training. For investigation, one case that targets the feasibility of constructing a virtual community by using ICT is explored. Both opportunities as well as challenges of developing a maritime community through ICT are investigated. The case uses the development of ICT at the Myanmar Maritime University to support a scholarship program as a unit of investigation. The application of ICT in the context of the scholarship program is argued not only to have the potential to improve the students' education and training but may also concretely result in the increase of job opportunities both nationally and internationally after the students complete their education.

Chapter two puts forward the notion of knowledge clusters to analyze collaboration within a particular sector of industry. Porter's (1998) diamond model is introduced as a tool for analysis and its featured dimensions are briefly introduced. The author also targets how ICT can support both internal and external processes within the knowledge cluster.

Chapter Three describes the research methods and the reasons why the author choose these methods. A relativistic approach to scientific inquiry is applied. Traditionally, in quantitative studies the collection of data is based on strict rules and procedures. In real world research, especially related to the social sciences, the pursuit of objective knowledge and finding a constant relationship between events are however receiving critique. This dissertation employs a relativistic approach to scientific inquiry, which is commonly used in flexible research designs The idea of an external reality based on theoretical constructions is rejected and instead focus is put on how reality is interpreted from the perspective of the research participants.

Chapter Four positions the scholarship case within the notion of knowledge clusters to analyze interactions and development within its particular segment of industry. The functioning of the Myanmar Shipping Industry and the development of human resources for education and recruitment is discussed with a focus on the Myanmar Maritime University as a MET institution. In addition the opportunities of applying ICT are positioned.

Chapter Five explores how ICT may practically support the scholarship program through the development of a technical prototype. Using the specific case of the scholarship program at Myanmar Maritime University, the technical prototype shows how ICT can be used to change the current operation and interaction between the shipping industry, an educational institute, and the government.

Chapter Six evaluates how the new ICT system supports interaction between the actors in the knowledge cluster. It is elaborated on how ICT may strengthen the interaction of the actors within the maritime knowledge cluster; the importance of including both social and technical consideration in the design of ICT; and finally the capabilities of the fourth generation technical platforms that are used for the technical design within this study.

Chapter 2
Theoretical underpinnings

The society we live in is rapidly changing into a knowledge society (Nonaka, 1994). The successful management of knowledge plays a key role in the interplay between technical product development and strategic organizational development.

This chapter gives an introductory overview of how ICT can be used to further the management of knowledge with a focus on the actors in the maritime cluster. Three areas of interest are described:

- Knowledge clusters: An overview is provided of how ICT may be put to use in the knowledge cluster with a focus on the development of human resources, not only in the education sector but also recruitment in interaction with the shipping industries. Knowledge clusters are used to position the contribution of this study.
- Information Communication Technology (ICT): The capabilities of ICT systems are rapidly developing, which opens for new possibilities to support organizations and industries. For this study, relevant definition of ICT systems is given.
- Virtual Communities: ICT is put in the context of the notion of virtual community that can be used to describe social interaction and exchanges between users online.
- IT design approaches: The final section describes the importance of both technical and social considerations when designing a virtual community.

2.1 The knowledge cluster and its characteristics

Entering the information age, the successful management of knowledge has evolved into a strategic focus to grasp and retain a competitive advantage. In the construction of knowledge, managing information and relationships from diverse sources is essential for new business opportunities (Asheim, Cooke, & Martin, 2006). For a

given industry, this concerns developing and maintaining both national and international social interactions. To this end, being able to combine technological and human resources is important to create the structures concerning the concept of knowledge management (Raisinghani, 2000).

To discuss how a sector of industry can develop, the notion of knowledge clusters is applied. A knowledge cluster can be used to define networks in private, government, and academic sectors that collaborate through, for example, exchanges of information, project planning, and joint research entities. Within a knowledge cluster, one may also discuss how technical innovation may be organized around universities, public research institutions and industry entities within or around a particular region.

With the diamond model, Porter (1998) offers an approach to analyze how it is possible to benefit from concentrations of interconnected industries and institutions within a knowledge cluster (see figure 1). The simultaneous existence of competition and cooperation is significant in this model. The basic idea of the framework is to define the scope and organization of a nationally or internationally derived knowledge cluster and to determine its strength and how it may lead to economic opportunity and ultimately to a sustainable competitive advantage.
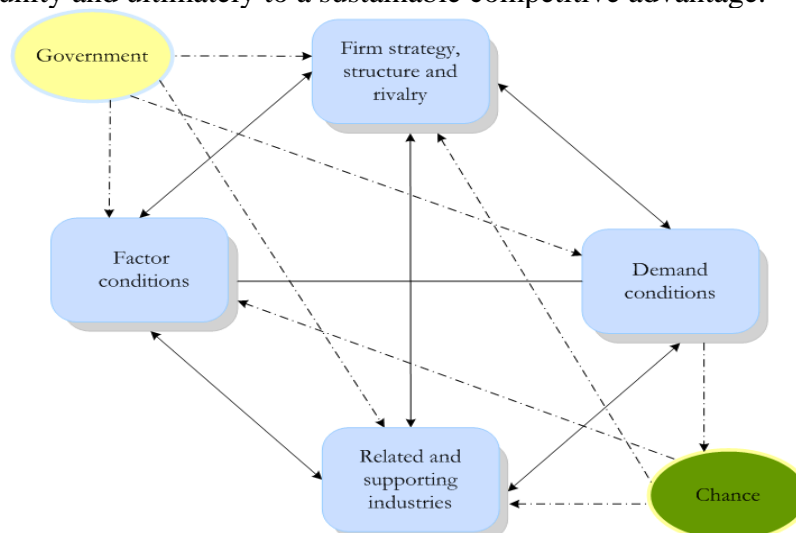
Figure 1 - Porter's Diamond for the competitive advantage of Nations
Source: Porter (1998). *The Competitive Advantage of Nations*, Creative Print and
         Design, Great Britain, 1998.

As is illustrated in the figure, the diamond model consists of four interlinked dimensions: firm strategy, structure and rivalry, factor conditions, related and supporting industries, and demand conditions. In addition, two exogenous variables are defined: "chance" and "government" that affect all other components.

Using the diamond model is increasingly to analyze knowledge cluster within the maritime industry. An example of one such application is given by. Benito et al. (2003) to analyze the competitiveness of maritime situated knowledge clusters where it is pointed out that: "Even though each of the different dimensions are important in order to create well functioning clusters, it is imperative that they work together rather than in isolation". The following section briefly introduces the different dimensions of the Porter's diamond model in a way relevant for the maritime industry and to this study. The description is based on Benito et al. (2003).

2.1.1. Factor conditions

"Factor conditions focus on the competitive advantages of an industry stemming from the economical, social, cultural, and/or natural resources" (Benito et al., 2003) that are available to a particular knowledge cluster. Traditional factors relevant to the maritime industry include, for example, physical resources such as for example the availability of modern harbors. Factor conditions of arguably increasing importance - and that are of particular relevance to this study - include access to competence within the academic sector where universities are an important contributor and human capital - i.e the knowledge and competence of those that work in a particular sector. In a survey conducted by Benito et al. (2003), it was found that the supply of qualified labor was rated as the single most important condition towards a thriving maritime sector.

A working ICT infrastructure may also be considered an important supporting factor condition. Overall, there are a variety of ICT systems of relevance to support a maritime knowledge cluster, depending on the task and environment at hand.

2.1.2 Demand conditions

"The maritime industry is by its nature a global industry" (Benito et al., 2003) and the competitiveness of a national maritime industry is strongly correlated with the global business cycle. For a knowledge cluster to remain competitive in the global market, it is important to continuously develop products, services, and know-how. To this end, ICT may support the improvement of both services and value.

In this study, the continuous demand for qualified seafarers in the global shipping industry is a central component. For both so-called developed and developing countries it is important to have a domestically competitive industry to meet this demand.

2.1.3. Firm strategy, structure and rivalry

Firm strategy, structure and rivalry entail continuously improving products, services, and processes. This includes output as well as the continuous development of internal capabilities of a knowledge cluster.

According to Benito et al. (2003), "although inter-firm rivalry disciplines firms to focus on efficiency and innovation, and hence promotes the long-run competiveness of an industry, selective cooperation among competitors is also important". It can be argued that for certain tasks and activities - including training, research, and development - overall competitiveness may increase if firms chose to work together. In addition, both domestic and foreign competition and collaboration may promote organizational development. Overall, it can be recognized that ICT may play both an important strategic and supporting role in the above dynamics between firms.

2.1.4. Related and supporting industries

"Few, if any, industries can operate in total isolation" (Benito et al., 2003). Reliable access to good quality supplies at the right price is a key to making a profit while keeping customers satisfied. Also complementary competencies are needed to cover new ground in the development of new products and processes.

Related and supporting industries hence play a vital role in developing the capabilities of a knowledge cluster. Such industries can be defined as those that partly coordinate and/or share activities in the value-chain of the focal or core industry, and as those that complement products related to the core industry (Asheim, Cooke, & Martin, 2006). As the maritime industry is becoming increasingly knowledge intensive, a supporting actor that is of growing importance is the academic and training institution including universities that can be a valuable provider of new knowledge.

2.1.5. Role of the government

"For good and for bad, governments may play a vital role in shaping the environment in which firms compete" (Benito et al., 2003). Instruments commonly used by governments to support the domestic shipping industry, but that are receiving increasing critique, include preferential national procurement policies and subsidies in regard to, for example, national ship building yards. In addition, a government may, however, also work with shaping the environment by upgrading resources, skills, and infrastructure to support the development of the national maritime sector. All these components are relevant for the effective use of ICT.

2.1.6. Chance

"The maritime sector is significantly affected by a variety of so-called chance factors; i.e factors that are largely outside the scope of control of individual actors in

an industry". Examples of chance factors include an increased environmental awareness and an increased oil price that have directed more and more transportation towards the sea.

In terms of technological advances the most profound are undeniably in the IT area which may open unforeseen developments (Stopford, 2002). In this study, it is argued that the capabilities of the rapidly advancing ICT technologies presented may constitute a chance to enhance education, training, and career opportunities for students within the maritime educational sector. Such relevant technologies are introduced in more detail in the following sections.

2.2 Information Communication Technology platforms

ICT platforms are being dramatically developed day by day. This study focuses on a particular instance of such platforms called Content management systems (CMS). Today there are a wide variety of CMS available in the open source community and in the commercial market (http://en.wikipedia.org/wiki/List_of_content_management_systems).

To design a technical prototype for the purposes of this study, a technical platform called DotNetNuke is used which is an open source solution and thereby freely available to everyone. DotNetNuke is a fourth generation web-based platform written in VB.net for the ASP.net framework. In fourth generation web-based platforms, an existing framework, as well as software modules, can produce a complete technical product through administration and configuration. Traditional programming skills are thus not necessarily required for a successful outcome.

Below some of the fundamental characteristics of the DotNetNuke platform are described. Although particulars may differ, overall, it can be recognized that many fourth generation web-based platforms work in similar way. Practically, the platform acts as a host environment that contains aspects such as menu and security

management. It becomes highly adaptable for building custom applications with different pieces of functionality such as document management, announcements, and forums. Often a number of readymade and configurable components are available, which can make it possible to quickly implement a feature in the portal (Walker et al., 2005).

DotNetNuke has a control panel that is divided into three main sections: Page Functions; Module Functions; and Common Tasks (see figure 2).
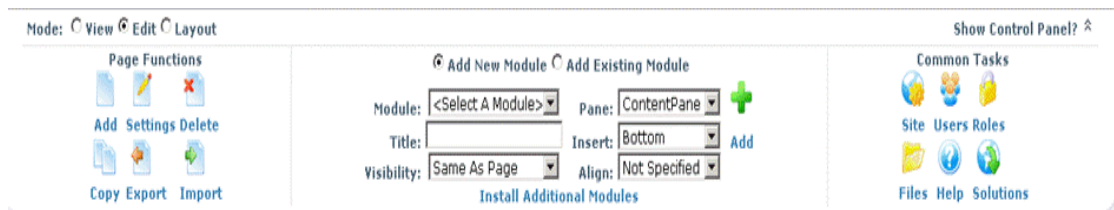
Figure 2 - The control panel of the DotNetNuke technical platform
Source: Author.

Clicking the "Add" button in the Page Functions of the Control Panel can create a new page. The "Delete" button can be used to remove a page. The "Setting" button is used to modify a page created and can also be used to edit the current page or to modify all the properties of the page.

Through the module functions menu, a module defining a specific piece of functionality can be added to on of the different content panes available on the website (see figure 3). The content panes define the structure of the website design. One content pane can contain one or many modules.
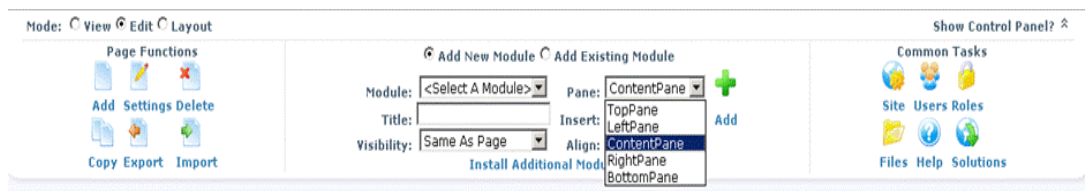
Figure 3 - The content pane in the module functions
Source: Author.

The available module available in the DotNetNuke installation can be selected from the module list as illustrated in figure 4.
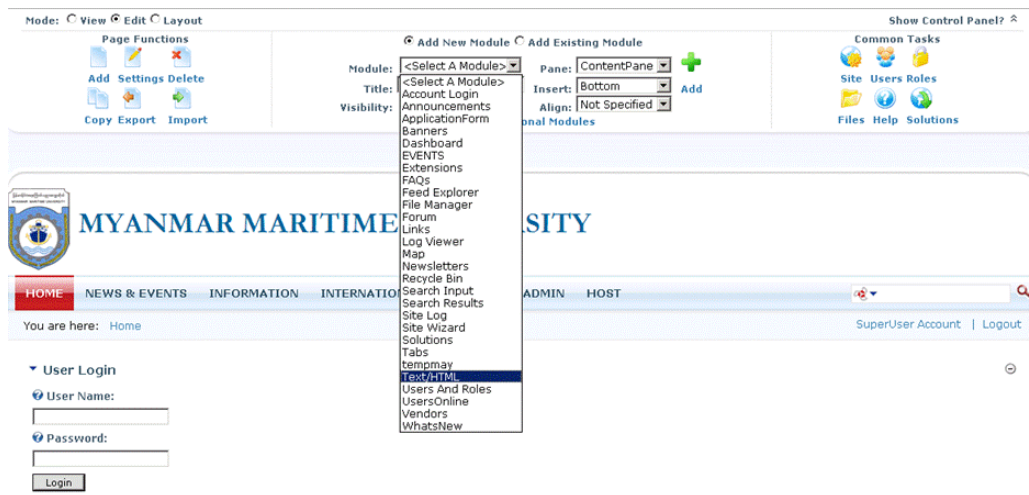
Figure 4 - The module function in the control panel
Source: Author.

DotNetNuke comes with a number of basic modules. However, additional modules can be installed according specific business needs (Walker et al., 2005). Adding, editing or deleting modules from the installation can be conducted without any adverse effects. Therefore, the application can be easily modified to accommodate unique organizational requirements.

Common Tasks can be seen on the right side of the Control Panel. The users and roles menus, for example, allow an administrator to define permission settings for the website. Access permissions can, then, be defined for an individual page or module**.**

2.3 Virtual communities

Within the context of this study, the CMS DotNetNuke is used to construct a virtual community. A virtual community supports human interaction with communication media for social, professional, educational and other purposes. It enables social interaction and exchange between users online rather than face-to-face and can

support information sharing within an organization. Practical examples of pieces of functionality may include chat rooms, newsletters, telephone, email, online social networks or instant messages. A virtual community provides new opportunities for interpersonal relationships; allow networks that provide sociability, support, information, a sense of belonging, and social identity (Wellman, 2001). Using a virtual community, participants can not only exchange information but also contribute to the development of the knowledge. Depending on the mission of the virtual community or work group, face-to-face meetings can bring problem solving, developing new capabilities, leveraging best practices, standardizing practices, time savings, increasing talent, and avoiding mistakes (Rheingold, 2000).

2.4 Designing for social and technical co-development

How is it possible to practically work with the design of ICT, both usability of technical tool and its usefulness in an organizational or industry setting?

Andersen, et al. (1990) argues that knowledge from many professions are required for systems development and it can be recognized that many different actors have to cooperate in the design process of ICT, including both work categories with business and technical know-how. To this end, a challenge becomes to evolve "working relations of technology production and use" (Dittrich et al., 2002).

The work within this study includes systems development that traditionally consists of activities like programming, system description, feasibility study, conversion, maintenance, and training of users, project planning, estimation, and quality assurance. All these activities aim at changing an organization through the use of computer technology.

The particular system development approach selected to guide this study is Extreme Programming (XP), which is part of a family of so-called agile methods. Agile methods ought to function, as the name suggests, by providing quick and simple

solutions to software development (Abrahamsson, et al., 2002). XP was developed to counter long cycles that characterized traditional software development methods (Abrahamsson, et al., 2002). It is said that one of the major strengths of XP is its involvement of the customer/user in the development process that ensures the user gets the software he/she needs. XP has a number of practices that gives support throughout the development process. These practices are under-lain by fundamental values, fundamental principles and basic activities. In total, 12 practices have been discussed by Abrahamsson, et al. (2002). In the context of this study in particular three of them are utilized:

- To be able to incorporate changes and use different kinds of practices, a fundamental approach is to work with a "simple design" to guide the technical development. This makes it easier to work with re-factoring to integrate new design ideas relevant to the business organization and the understanding of the scholarship process within the knowledge cluster.

- A "metaphor" outlines an overall mission for the system. Not having a metaphor or having a "wrong" metaphor can have negative consequences for the resulting outcome such as development of an unsuitable piece of functionality and waste of resources as, for example, time.

- The different features and individual functionalities of the system are described from a business point of view on "story cards". The story cards are then prioritized and incorporated in the system development process through a "planning game". During the implementation of the system the programmer translates the stories into a workable system.

It is said that XP is suitable for addressing the needs of small to medium software projects with few or vague requirements (Abrahamsson, et al., 2002; Karlström, 2001). As Wells (2001) points out, XP serves the purpose of systems whose functionality is expected to change.

Chapter 3
Research methodology

The work within this dissertation is based on a flexible research design where the purpose is not to make a random sampling for the basis of quantitative analysis, but to understand the dynamics within a single setting. By using a flexible research design (also known as qualitative) approach in the present setting, it is possible to assume from and interpret how stakeholders perceive their own reality and their relation to it. In flexible research, reality is perceived as socially constructed and notions such as knowledge and truth are relative to the specific schemes of conceptions, for instance a theoretical frame, a form of life, a society, or a culture (Robson, 2002). It is thus not possible, nor the objective, to try to portray and all-encompassing reality. Data and interpretations are not fully separable.

Practically, a focus has been put on the emerging research process and the design strategies have depended upon the changes in the situation, circumstances or experience of the participants. The research process has thus not been dependant on a tight pre-specification or rigorous hypothesis testing.

3.1 An individual case study

The case used in the dissertation relates to the specific position and work practices of the scholarship process at MMU. As shown in the next chapter, the scholarship process practically involves all the main actors present in the knowledge cluster: industry, government, and educational institutes which in this case constitute an influential supporting actor.

The next chapter is based on a literature review and discussion with relevant stakeholders. In relation to the main dimensions of the knowledge cluster, it is shown how it is possible to position and situate a potential contribution of ICT in relation to the case of the scholarship process from a strategic point of view. A foundational concern underpinning the discussion is that for Maritime Institutions, both

maintaining and developing national and international relationships have a high priority to further. This is, especially, important for a developing country like Myanmar to improve the national maritime competency base and enhance the affiliation with international maritime industries.

Thus, through a flexible design project, ICT can be applied to build a virtual community to strengthen social interaction within the knowledge cluster. As described particular attention has been given to the practices of simple design, metaphor, and planning game. The application of these practices have enabled an evolving understanding regarding the feasibility of different technical functions and configurations of standard modules as well as programming of tailored pieces of functionality. This investigation combines social and technical concerns and is described more in-depth in chapter 5.2. To this end, an overall challenge and an opportunity in the design is the technical codification of the relations and know-how that exists today. When it comes to the development of interactive IT software support, the question of how to codify knowledge without losing its distinctive properties such as contextual richness, the human cognitive dimension and thus turn it into less vibrant information or data is central (Davenport and Prusak, 1998; Skyrme, 1999).

Within the context of this study, it was also important to base the codification of knowledge on the conditions identified in the knowledge cluster analysis. The main area explored is how it may be possible to deploy ICT to improve communication and smooth operations between the targeted actors.

Chapter 4
An Analysis of industry for competitive advantages

Part four of this study shows ICT's potential role within the knowledge cluster from the perspective of one particular case instance: the possibilities to develop the process around the scholarship program through ICT. It is not the intention to put forward an all-encompassing analysis of factors affecting the knowledge cluster, but rather to position how ICT as sub component may support the communication and exchange between different dimensions and actors. Myanmar Maritime University and its stakeholders by applying will be analyzed using Porter's diamond model. Challenges as well as opportunities are identified.

4.1. An overview of the conditions underpinning Myanmar maritime industry

Myanmar is considered to be a "developing" country in regard to the current state of its Maritime industry. Although Myanmar, with its many rivers and long costal region, has good natural conditions for an extended national water transportation system it can be recognized that it is still comparably weak.

Considering developments underway, Myanmar does, however, strive for a rapid extension of its maritime related capabilities. In terms of infrastructure, rivers and a new deep-sea port are for example under development. Such initiatives are both intended to benefit domestic maritime transportation and industry and improve Myanmar's position as a global maritime actor. These developments are reflected in statistics from the UNCTAD maritime review 2007 (see appendix 1 for more information)

In addition to infrastructure, human resources may be considered. According to the department of marine administration there are 66,210 (up to 2008) Myanmar seafarers officially registered for ocean going vessels with the Seamen Employment Control Division (SECD) which operates under the auspices of the Department of

Marine Administration (DMA) (see a breakdown in appendix 2). This includes between 40,000 to 45,000 seamen that annually serve on international shipping lines[1].

4.2. An increased demand for qualified seafarers

Maritime Services are playing an increasingly vital role by transporting merchandize cargo of all kinds, as for example oil and gas. In addition, foreign going ships, luxury liners, and holiday cruises have become popular and thereby further increasing the demand for shipping services (Michaelowa and Krause, 2000). To provide these services, it has become necessary to have a growing number of skilled and highly competent sailors, officers, and engineers.

This has opened up possibilities for arguably especially eastern countries including Myanmar to compete with the rest of the world to produce more professionals in the maritime field.

In times of an increasing need for seafarers, the shipping industries are also looking to recruit new young seafarers directly from the maritime universities. This provides a cost benefit as well as seafarers with the most recent qualifications[2].

To this end, and to become an all-round maritime actor, a focal point is to not only produce a great number of seafarers – quantity - but also focus on the development of relevant and competitive capabilities and competencies – quality. A step in this direction was achieved by becoming a white-listed country according to the 74th session of the Maritime Safety Committee of the International Maritime Organization (IMO) in 2007.

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[1] The number of seamen serve on international shipping lines is received from the discussion with Academic Dean from Myanmar Maritime University.
[2] http://www.myanmar.gov.mm/NLM-2002/enlm/May19.htm

4.3. The strategy of industry actors included in the maritime knowledge cluster

The water transport sector is an essential service and is also often an important factor in the development of a strong economy on the national level (Michaelowa and Krause, 2000). Therefore, nations, and emerging eastern economies, are especially making efforts to develop competitive Myanmar maritime technology and to nurture and produce highly qualified seafarers, marine officers and marine engineers.

The Myanmar shipping industry is now putting considerable efforts into standing shoulder to shoulder with other international actors. On a national level this is considered of essence to strengthen the national interests and economy as well as earning more foreign currency[3].

Myanmar also has a growing number of workers holding seafarer certificates, and more workers means greater income for the country. In spite of efforts to produce maritime officers and engineers, there is a shortage of Myanmar seafarers due to the yearly demands of the shipping industry[4].

To complement the services of existing educational institutes and training facilities the Department of Marine Administration (DMA) encourages ship-owners and manning agents both nationally and internationally to assist with qualification development.

4.4. MET institution as a supporting actor

Within the mandate of the MMU is to contribute to the development of the maritime transport sector by developing human resources both for the education sector and for recruitment by public and private organizations in connection to the maritime industry. To this end collaboration with partners is a key component.

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[3] http://www.myanmar.gov.mm/NLM-2002/enlm/May19.htm
[4] http://www.unescap.org/ttdw/Publications/TFS_pubs/Pub_2079/Pub_2079_Myanmar.pdf

For educational purposes, although basic training facilities have been established, additional training capabilities are still in need. To develop a comprehensive maritime education system for students and to upgrade teaching and promoting teachers' qualifications, MMU is therefore affiliated with international institutions and societies.

As stated in the prior section, national and international partners within the shipping industry also constitute important collaboration partners. In times of increasing demands seafarers with up to date competencies, the shipping industry is interested in collaborating directly with universities. By being able recruit already young but well-qualified seafarers, the shipping industry is hopping for cost benefits and thereby better commercial financial outcomes. Such collaboration is also inline with the interests of the government to enable an increasingly prominent position within the international maritime community.

One important component, which is the main interest of this study, in the collaboration between shipping companies and MMU is a working scholarship program. The scholarship program enables the shipping industry to participate in the full-scale training of students and is a way to ensure that future seafarers meet with international standard in order to maintain the competitiveness of respective marine work forces.

A Memorandum of Agreement (MOA) between MMU and national and international Merchant Maritime industries govern appropriate practical as well as academic maritime training within the scholarship program. Depending on the students qualifications and interests, examples of scholarship opportunities include shipyards and on board training with the help of Department of Marine Administration (DMA), Myanmar Five Stars Shipping Line (MFSL) and other departments under Ministry of Transport (MOT) as well as national and international shipping industries.

An additional benefit from the students' point of view, by participating in a scholarship program is that they may get job opportunity a without paying an agent fee, unlike most seafarers who are seeking overseas shipping jobs. This is believed to inspire the students to work hard with their studies to become eligible for a good scholarship position.

MMU seeks to continuously develop its cooperation with affiliated partners within the scholarship program. A strong interaction within this cluster of affiliated actors is of essence and may be regarded to constitute a precious opportunity not only for the development of MMU and the training of its students, but also for the other partners involved. Currently, it may, however, be argued that the process surrounding the scholarship program can receive further development to ensure a smoother operation.

4.5. The important role of government

The government of Myanmar is playing a vital and active role in shaping the environment of academic matters and has launched several programmes to increase the role of ICT technology. The government is today making efforts to enable the nation to keep pace with others, to bring about harmonious and equitable development across the nation, and to strengthen the national economy[5]. Overall, in striving to enhance the national economic life, systematic measures are being taken to improve the production sector, the transport sector and the trade sector that contribute to economic improvement. This includes efforts taken within the maritime transport sector as it plays a key role in economic development (Sletmo, 2001).

The government of Myanmar is also strongly encouraging the use of ICT in socio-economic development. Five focus areas have been identified: ICT Infrastructure, ICT Legal Infrastructure, ICT Education, ICT Application, and ICT Industry. Examples of practical measures taken include the establishment of e-learning centers,

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[5] http://www.unescobkk.org/fileadmin/user_upload/ict/Metasurvey/MYANMAR.PDF

e-resource centers and computer training centers in connection to the education sectors[6]. By leveraging the benefits of ICT, the government of Myanmar wants to increase productivity, market penetration, reducing cost, and improving services in socio-economic organizations.

The government of Myanmar is also taking an active stake in the maritime education sector and MOT has for example a responsibility for students serving within the maritime industry both nationally and internationally. In addition, the Department of Marine Administration (DMA) is the sole organization with the agreement of the shipping companies concerned to control recruitment, welfare, and the rights of all Myanmar seafarers.

4.6. New ICT as an opportunity to develop the organizational process

The development of new ICT systems may be may be recognized as important component with the potential to shape the interaction between Myanmar Maritime University (MMU) and its stakeholders. Given the scholarship programs position within the knowledge cluster, the following chapter investigates how it is practically possible to develop a usable and useful technical prototype to improve collaboration and smooth operation between the actors involved.

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[6] http://www.ibe.unesco.org/International/ICE47/English/Natreps/reports/myanmar_ocr.pdf

Chapter 5
Case study – The scholarship process and an exploration of how it can be approved through the application of ICT

5.1. An overview of the function of the scholarship program

Myanmar Maritime University scholarship constitutes an example of how the main actors present in the former introduced the notion of a maritime cluster may interact with each other.
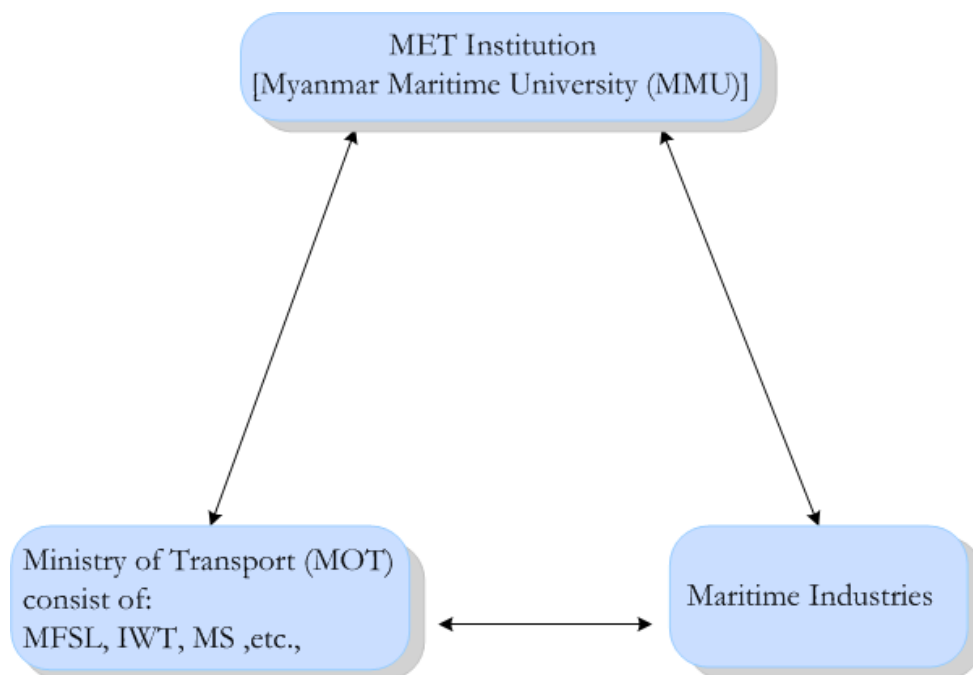
Figure 5 - The relationship of the University with its stakeholders
Source: Author.

As a MET institution, it is within MMU's core interest to give its students great opportunities both during and after their education. Therefore, MMU strives not only to upgrade the students' knowledge base but also to present them with good job opportunities. To get a scholarship is put forward as such an opportunity as it in addition to having educational qualities also gives a student a possibility to, for example, seek overseas jobs and avoid paying agent fees to a shipping company. The scholarship program thereby is intended for and encourages outstanding students

who through the program ultimately get a chance to be recruited by the shipping industry, who in their turn get a young seafarer with a good education and training from a MET institution. The shipping companies' contribution is to assist the university by the establishment of a scholarship fund as well as providing onboard training to the students. The students accepted into the scholarship program will, thus, not only get sea service during their training period and scholarship funding sponsored by the shipping company that they are assigned to, but will also become Apprentice Officers and Apprentice Engineers. It should be noted that, the students who are not awarded a scholarship are also guaranteed to get career opportunities after their graduation, but under the various departments of the MOT. So far, the scholarship program relies on the specialization. At present the scholarship is a component available in the "Nautical Science (NS)" or "Marine Engineering (ME)" degree[7].

If accepted into the scholarship program, the shipping company pays a monthly training allowance to the individual student during the training period. After onboard training, the shipping company pays to each of the students only once a study allowance.

With respect to the requirements of the STCW Convention (STCW '95), the required training period is basically twelve months. This period can, however, either be reduced or extended according to mutual agreement, which is defined in a Memorandum of Agreement (MOA) between the involved parties. A shipping company makes a training agreement with each of the students before they join the training vessel. According to the regulations of MMU, with respect to the

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[7] The degrees offered are: B.E (Naval Architecture), B.E (Marine Engineering), B. E (Port and Harbor Engineering), B.E (River and Coastal Engineering), B.E (Marine Electrical Systems and Electronics), B.Sc (Hons) (Nautical Science), Dip S.M (Post Graduate Diploma in Shipping Management), Dip P.M (Post Graduate Diploma in Port Management)

requirements of the STCW Convention (STCW '95), students may be required to perform a sea service course after their graduation.

The terms and conditions of the training are in accordance with the regulations of the shipping industry. The students have the obligation to serve on board the vessels of the shipping company for a period of maximum five years after graduation under the terms and conditions of employment as provided in the scholarship agreement unless otherwise exempted by the shipping industry. For future promotion, this depends on their good performance during the sea service. Many shipping companies come to MMU to recruit Cadets and Engineers.

According the MOA, both parties recognize the necessity to cooperate with each other in the education, training and employment of the students of MMU. Ministry of Transport (MOT) and the shipping industries are the vital maritime communities for the scholarship process and MMU is today cooperating with the various departments of MOT and shipping industries to produce educated knowledgeable and competent scholars for global maritime activities through human resources development (education and recruitment).

5.2. Re-designing the scholarship process using ICT

The basic goal of the ICT design work undertaken within the scope of this study is to design an explorative prototype that both focuses on the development of technical computer support and the tailoring of technical pieces of functionality as well as capturing the practices, interpretation, and appropriation of the user stakeholders. A substantial part of the study work was to practically design a technical prototype in using the DotNetNuke framework.

To support the design, the XP development framework was chosen because it's featured tools and techniques support technical development as well as the development of work organization processes. Inline with the development technique

of simple design, the overall mission of the process was to develop a basic prototype that could practically illustrate the feasibility of applying ICT to support the scholarship program.

The first practical step of the development process was to develop a suitable metaphor to guide the process. The metaphor must be able to give a clear picture on the overall purpose of the website. In this sense, it became an important part of the development process. To speak about the overall mission of the process of the development project, it is important to set the context: the metaphor of the University is to "stand shoulder to shoulder by utilizing maritime knowledge in the international maritime filed" ("ဆရာကြီးဝိုင်းဝန်းခဲ့တစ်လွန်မြို့ ").

As illustrated in figure 6, it was prudent to develop the metaphor first as it guided the development of individual pieces of functionality through the planning game and the development of the story cards. Thereby, the metaphor served as a vision statement that encapsulated the function of the system.
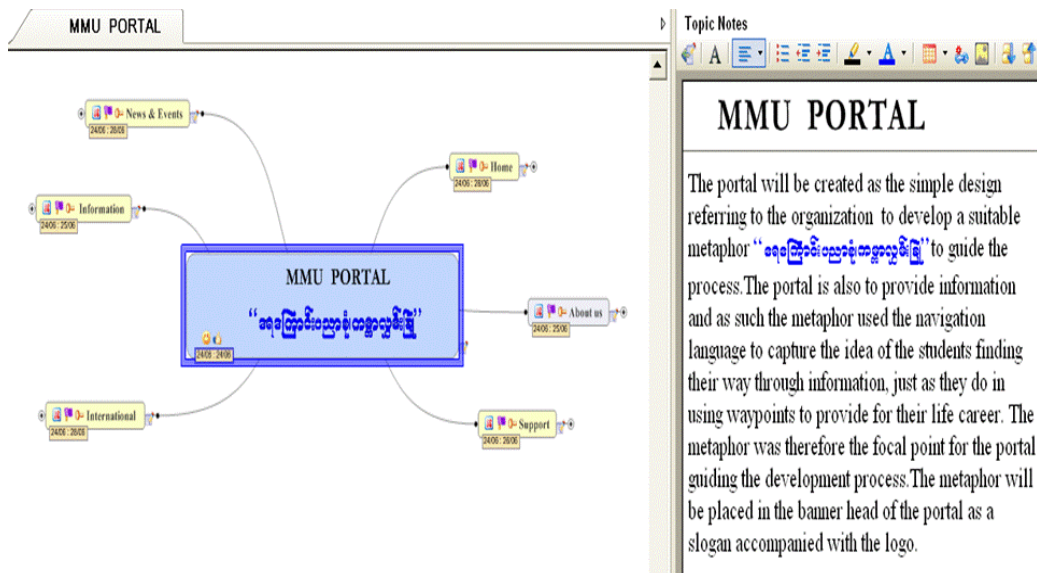
Figure 6 - MMU metaphor with story card
Source: Author.

The metaphor was selected because it captures the spirit of the system in an appropriate way: a) guiding light to students; b) developing a comprehensive MET system; c) nurturing the ethical, skillful and reputable maritime experts to compete in global market; d) carrying out for the development of the maritime company and e) making plans and arrangements for perpetual development of the maritime company. In this way, the metaphor works like a point of reference for the students to find their way in fulfilling their welfare needs. It captures the essence of a number of navigational aids which are important to students, while simultaneously providing for the action to be taken (such as affiliated partners, discussion forum).

The site was also to provide information on application forms and job opportunities, and as such the metaphor used the navigation language to capture the idea of the students finding their way through information, just as they do in using waypoints to provide for their life career. The metaphor was therefore the focal point for the portal and guiding the development process. The metaphor will be placed in the banner head of the portal as a slogan accompanied with the logo for the portal and is shown in figure 7.

Figure 7 - MMU portal design with slogan
Source: Author.

The next step was to describe the desired features of the system on individual story cards. Writing the story cards was a lengthy process but being guided by the metaphor made the process less onerous and may have reduced the time. A story card consists of two basic parts: a work situation description giving a relevant account of what a particular work process looks like today; and a vision for future change where both technical functions and interfaces are described as well as a envisioned future work organization. It should be emphasized that neither the work situation description nor the visions for future change are intended as an exhaustive or objective definition. They should serve as a for the stakeholders relevant description of the purposes of the project which in this case is to design an explorative prototype. Figure 8 shows an example of an individual story card. During the development process, the importance of each story card was discussed and arranged in order of priority as agreed by the stakeholders.
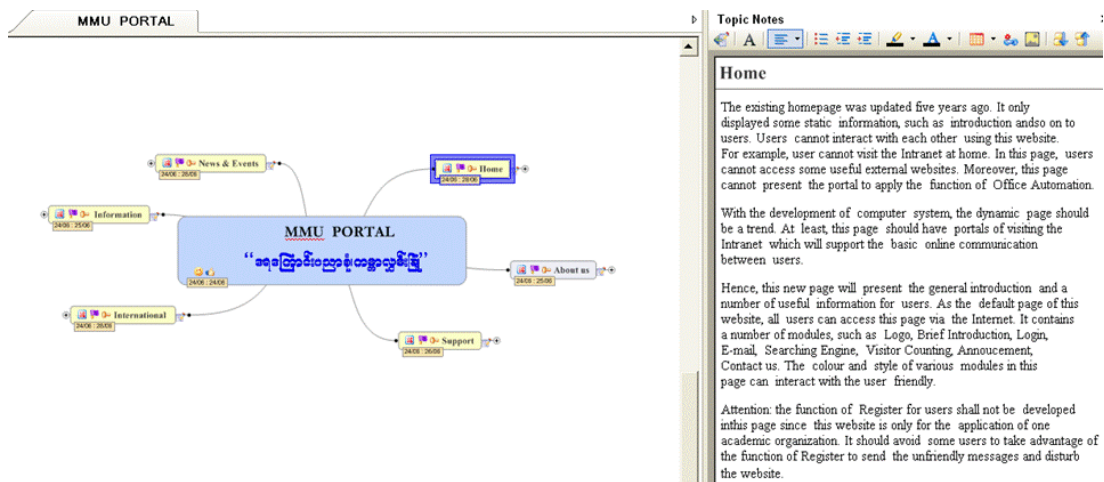
Figure 8 - MMU home page with story card
Source: Author.

It was found that the process was not as linear as the initial impression. It was not a case where the story cards were written and then development took place. From time to time additional story cards were added and unnecessary story cards discarded as the understanding of how ICT could contribute to improving the scholarship process within the knowledge cluster incrementally increased. It is believed that having story cards ensured that a systematic and simple approach was taken in the development of the system allowing for continuous testing and sometimes immediate changes, corrections etc. The story cards kept the focus and allowed the work to continue. The following two sections compile the story cards and give a description of the current work situation and the vision for future change.

5.3. The current situation of the student scholarship program

The scholarship process is the salient factor among the organizational processes and how it is operated at the present moment at Myanmar Maritime University (MMU) is illustrated in figure 9. As stated above, the below description is an, overall, exemplification of the main characteristics of the scholarship for the purposes of this study. Depending on, for example, the individual situation it may be changed.
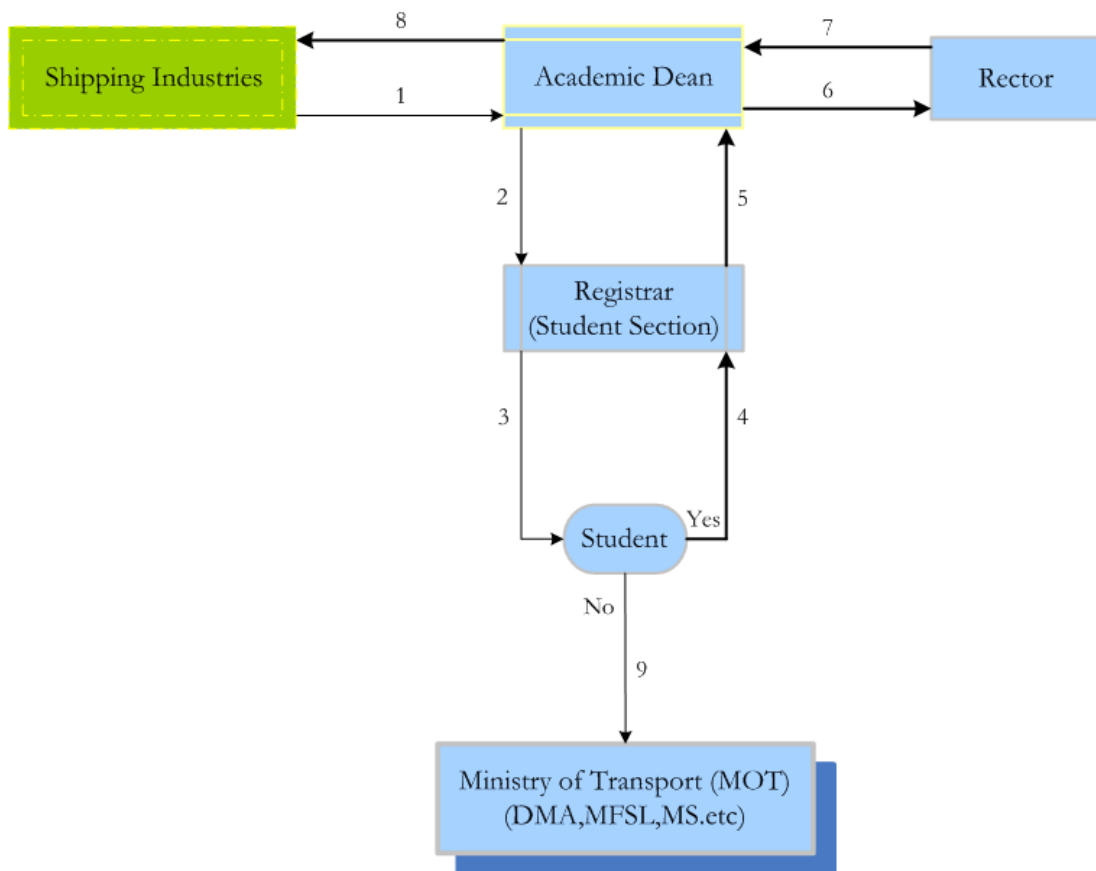
Figure 9 - The scholarship process
Source: Author.

Most of the industries based in Myanmar already know about the University and its programs. New industries, which are for example based in foreign countries, can get information about the university by arranging a visit through contacting the rector or academic by email or phone. Before a visit, an application has to be granted by the ministry.

A scholarship is awarded to the students during the first semester and in the second semester in their fourth academic year. The number of students is determined by shipping companies each year. Hence, they contact the university through the Academic Dean or Rector directly to award the scholarship in the order of the grades

for each student[8]. Therefore, the students' qualification has important consequences for the scholarship program because the University wants to award the scholarship only to outstanding students.

If they are interested in the scholarship program, mostly the shipping companies directly inform the Academic Dean by email or by phone. They give the information such as specialization, academic year, students' qualification and how many students they want to give the scholarship to. In addition, the shipping companies criteria for selecting which eligibility to include in this program is that, the students:

- have to be in the top one-third in their 1st semester of 3rd year class standing;
- have to be of good conduct and have no record of disciplinary punishment;
- have to be pursuing a career in sea service as officers, engineer officers or electrical officers;
- have to be physically fit for sea service and pass the medical check-up given at a clinic or hospital designated by shipping company and,
- have to agree to the terms and conditions of the Scholarship Agreement between MMU and the shipping company

The Academic Dean looks ahead at the terms and conditions with the Registrar (Student Section) to confirm the qualifications of the students that they require for this program and he compiles a list to give to the requesting shipping company.
The registrar informs the selected students that they will be interviewed by the shipping company representative. However, the student can refuse if he/she is not interested, for example, some students do not want to go on board ships like chemical tankers because they are worried about their safety. Unlike some students who want to go because they can get a good salary from working on this type of ship.

The Academic Dean shows the student list to the Rector for approval before he gives it to the shipping company. The list is given to shipping company through the

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[8] Memorandum of Agreement (MOA) from Myanmar Maritime University

University's mail system or the representative from the University goes and handover the list manually. The shipping company sends their Captain and Chief Engineer to interview the students according to the list. The shipping company notifies the selected students at the university after their selection within 15 days[9].

Negotiations then takes place regarding the terms and conditions of the MOA. The negotiation among else includes the length of the scholar program and the salary the student will receive. This is important for the students and if they are lucking they can get a good salary year after year with the minimum pay starting at US$300 per month as a cadet and US$1,000 for a training officer. After they pass the exam from DMA they will get a minimum of US$1800 per month[10]. After the terms and conditions have been negotiated the MOA needs to be signed between the University and the prospective shipping companies or industries as well as the students. Two Myanmar citizens, preferable family members of the selected student, stand surety for the scholarship Agreement as well as the training agreement. The University goes in as a witness of this agreement.

The students also have to complete in accordance with the application form of the shipping company. In addition, the students have to give the recommendation of MMU to the shipping company the determined number of students who meet the eligibility criteria set forth and in the order of grades accompanied by the following documents within 15 days after the interview:

- ➢ a certificate of academic records showing the grade and class standing in the most recent semester;
- ➢ a curriculum vitae;
- ➢ a letter of self-introduction;
- ➢ a health certificate issued by a doctor of a clinic or hospital designated by the shipping company

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[9] Memorandum of Agreement (MOA) from Myanmar Maritime University
[10] Memorandum of Agreement (MOA) from Myanmar Maritime University

Today, the University carries out most of the tasks by manual transaction because the university ICT is currently very weak. In this case, both parties have to go back and forth between the University and the shipping company because the University is far away from the city and hence it is difficult to handle to get a smooth operation. Up to now, both parties are using the University mail or sometimes giving a call to send information and thus there are several drawbacks to the organization.

5.4. A proposal for a future technical design – the future condition of the student scholarship program

5.4.1 New technical items of functionality: an overview

The portal prototype will be created as a simple design referring to the organization, the main story cards consistent with the priority will be created as Home, News and Events, Information, International, and Support stating the metaphor as shown in figure 10.
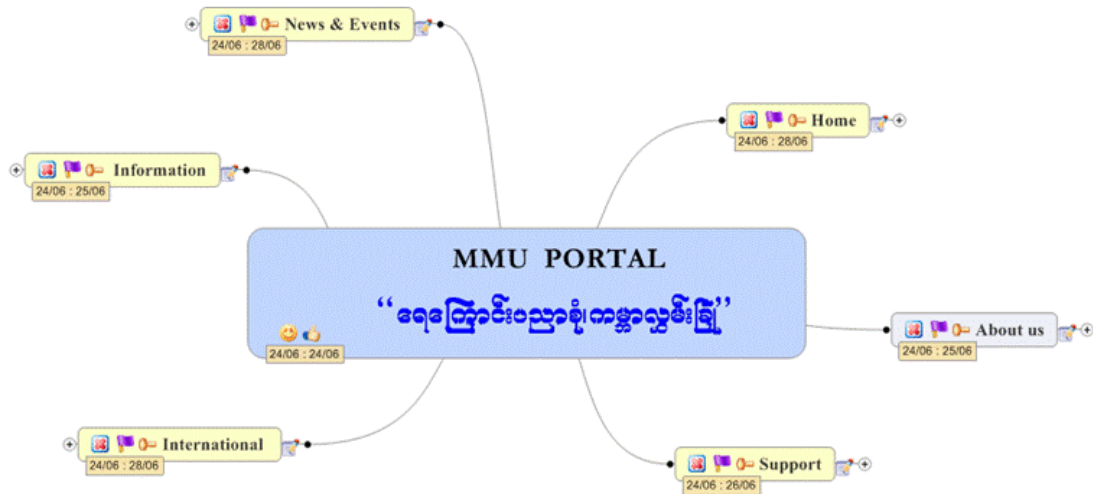
Figure 10 - MMU community web portal design
Source: Author.

With the view of the technical platform in figure 11, some modules such as Search Engine, Login, Announcements, Visitor counting and Contact Us will also be

available on every page to facilitate the users. International, Information as well as Support pages are only available for the individual users because of the information which is related to them.

The shipping companies enter the **home** page of the MMU portal if they want to know about University information. The home page has appropriate modules displayed and links to further information from the relevant modules. The appropriate user is then invited to register and how to register will be developed. The **news and events** page supports the current news and some occasional photos in the gallery and it will not be developed at the moment.

Figure 11 - MMU community portal design's technical platform
Source: Author.

As illustrated in figure 12, all the modules planned have been developed but are at various stages of activation. The modules are: 1) home , 2) news and events , 3) information, 4) international, 5) Support, 6) news and photos, 7) application form, 8) job opportunities, 9) international partners, 10) joint program & project, 11) conferences and seminars, 12) forum, 13) e-learning and 14) forum.
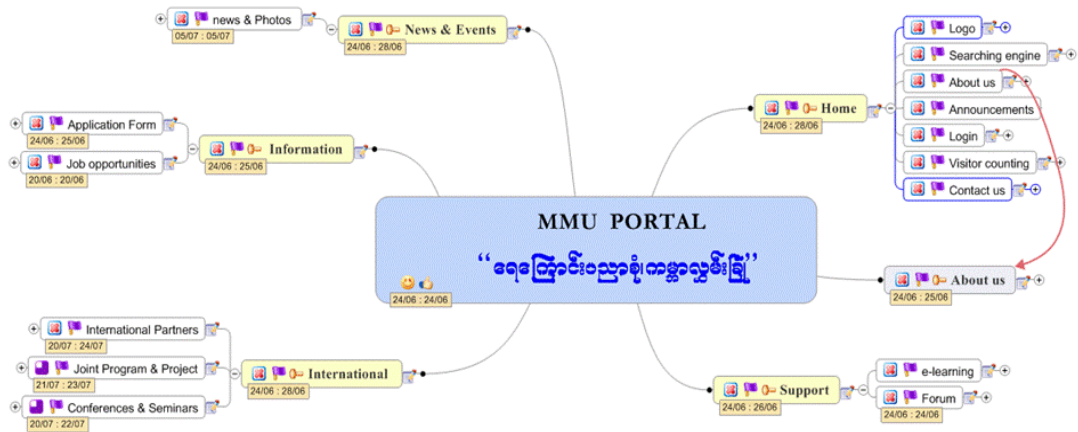
Figure 12 - MMU community portal design in detail
Source: Author.

There is an introduction about the information of the program of the University, the organizational structure being on view in the home page as illustrated in figure 13. From this page, all the shipping companies can obtain the University's information and can gain access to the University through this portal.

Figure 13 - MMU's information home page
Source: Author.

In the **announcement** module of the home page, important public events which happen at the University in the current day and also today's shipping company information related with the users, meaning the shipping company which has visited the University. Currently, this is not developed in this page, however, it will be presented in the future.

5.4.2 How the new pieces of functionality are used in the work process

Currently, the representative from both parties is manually sending information back and forth for the whole process of the scholarship program. In this case the transaction of the scholarship process takes several days and hence this is an ineffective method. For the sake of a fast and smooth operation instead of using the University's mail or giving a call for sending information, the **information** page is composed of an application form and job opportunities**,** which were developed according to the high priority placed on them by the user. Instead of having a different application form depending on the shipping company, it is basically created on the application form page.

The "application form" and the attached multiple files such as the recommendation documents and the other student qualifications which the company needs from the University can also immediately be sent through the website. Job opportunities of the information page is not developed. It will however be presented in the future. An application form was developed in the technical platform and it can change depending upon the shipping companies. The basic application form was developed as shown in figure 14. Due to its dynamic characteristics and specific requirements of how it should work to support the scholarship process at MMU, this was the only module that had to be specifically tailored using programming.

Figure 14 - The application form at information page
Source: Author.

The internal administrator accepts this form and sends all received application forms to the respective shipping company. After checking the students' qualification concerning the shipping company, a shipping company notifies the selected student list. At present, they send this information directly to the Academic Dean through the University mailing system. This function will be developed through this portal.

The **international** page presents the international partners, joint programs and projects and conferences and seminars. The students can easily get information concerning which professional institutions and universities that are affiliated with the University to develop a comprehensive Maritime Education System, to produce fully qualified undergraduates and to upgrade teaching and promote staff qualifications and to carry out the necessary research work for the development of the University.

Moreover, they can see which organizations support the University to give birth to international standard maritime officers, engineers and architects for ship building to offer related training because the University has provided shore and onboard training such as laboratories, simulators, workshops and shipyards; which shipping industries cooperate with the University to grasp a great chance and career opportunities for the students after graduation. The international partners page consists of link to the website of the affiliated partners and it can be shown in figure 15. Joint programs and projects and conferences and seminars page will not be developed at the present time.
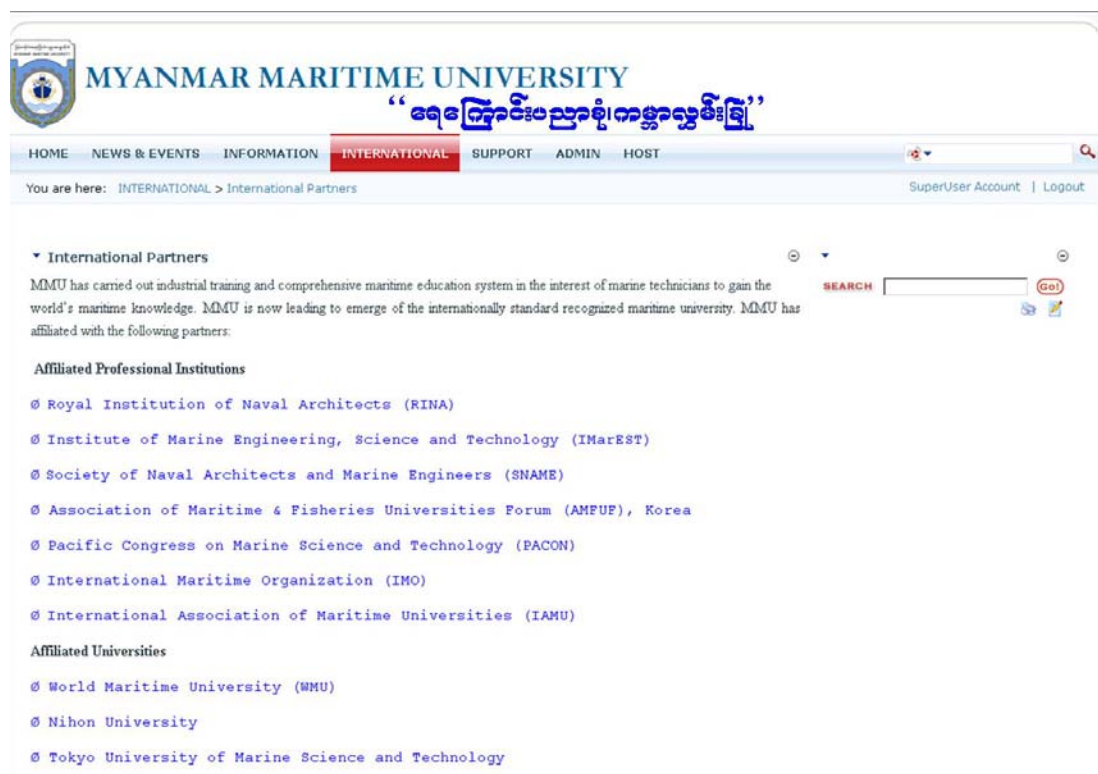
Figure 15 - The affiliated partners of the University international page
Source: Author.

As a result of this page, the students can directly enter the different shipping industries web site and can check each affiliated partners' information. For example, the students can decide whether they accept or not the scholarship from the company depending on their interest, by entering through this page. The **support** page consists of e-learning and a forum. The students can easily share knowledge and exchange

information in the forum but e-learning page is not explored in it but it will be presented in the future.

At the present time, most of the university functions are carried out manually because the current university ICT is at the infancy stage, however there will be more functionality with the new ICT system in the future. On the other hand, some functions such as giving information to the Academic Dean, checking the information with the Registrar, showing the students list to the Rector for approval and giving the list to shipping industries can not be created in the technical platform because the University is using the existing mail. Therefore, some of the functions will not be implemented in the technical platform. Also matching students' qualifications and negotiating a working arrangement is a complex endeavor that entail substantial tacit dimensions, within the scope of this study it was therefore not thought feasible to target.

Chapter 6
Evaluation – How the new ICT system support the knowledge cluster

Myanmar is seeking to develop its Maritime capacity. To develop qualified seafarers that are competitive in the global arena, one component that is recognized as important in this respect is furthering interaction between Maritime educational institutes such as MMU and industry, both nationally and internationally.

To this end, the scholarship program illustrates a process where the main actors present within the identified knowledge cluster collaborate already today. Through the analysis of the scholarship process as a situated component within the knowledge cluster dimensions conducted in chapter four using Porter's (1998) diamond model, it was shown how the maritime industry can support and interact with MMU as a maritime education and training institute through giving scholarships to students; how the government acts as both an indirect and direct actor, encouraging and facilitating collaboration through MOA and also employing certain groups of students; and finally how MMU may act in the role of a central supporting actor as an educational institute.

(1) Strengthening the interaction of the actors within the maritime knowledge cluster

The knowledge cluster analysis identified opportunities as well as challenges for development: although Myanmar already has a significant number of seafarers, there is a global demand for increasing numbers with up to date qualifications globally. It was also discussed that the Myanmar government already recognizes that ICT constitutes an important component to support education and training to improve communication and a smooth operation between actors. A challenge recognized in regard to the development and usage ICT identified is, however, lack of infrastructure.

Using the scholarship process as an example, within the particular case investigation of this study was to investigate the possibilities arising from recent development of ICT as a chance for development and. Through the technical prototype developed, the feasibility of developing a virtual community was explored. The pieces of functionality implemented practically show how, for example, shipping companies can get access to information about the University in an easier way and how the students can keep themselves updates concerning different upcoming scholarship opportunities.

In this case, the primary component developed was the application form that students can fill out online and that is then processed within the University and that also in the future may enable better compilation of information for external actors such as shipping companies and the government. The virtual community prototype thereby illustrates how it is possible in a practical way to respond to the opportunities of better communication and collaboration as identified through the knowledge cluster analysis.

(2) **A situated evolution including both social and technical consideration in ICT design process**

As made visible in this study, the development of interactive technical systems is not a stand-alone undertaking. Instead the development of in this case ICT support is highly dependent on an organizational process and in this case industry purpose and integrated with an understanding of and a development of also these domains. To this end, the practices of XP were applied with a special focus on the metaphor, planning game and story cards, and finally simple design. The metaphor linked the technical design to an overall purpose of the system rooted in the analysis of the knowledge cluster. Focusing on the practice of simple design highlighted that the aim was to investigate the feasibility of different pieces of functionality and also supported an iterative development. Writing story cards and prioritizing them through the planning game enabled an evolutionary exploration of the usefulness and usability of different

pieces functionality in the context of organizational and industry realities. In other words, developed functionality both has to be technically usable in regard to interface design. And be useful in the work practices of the users present in the organizational and industry setting.

A central concern illustrated through the development of the application form and the work practices surrounding is the codification of knowledge. The new online application form replaces a static manual version and may support adaptation to different requirements of different shipping companies and automatic distribution between involved actors. However, part of the current processing was not possible to further automate using ICT within the scope of this project as it involved complex social interactions and judgment ultimately relying on tacit knowledge. Hence, even though more of the process surrounding the scholarship program could be supported from a pure technical point of view using ICT, it was currently not feasible given organizational and industry realities. It is, however, important to stress that, as shown, the application of the XP practices enable an evolutionary process that support a continued design of the system in the light of for example an increased awareness of technical possibilities but also constraints. As Wells (2001) points out, XP serves the purpose of systems whose functionality is expected to change. In addition, as stated by Abrahamsson, et al., 2002 XP is suitable for addressing the need of projects with little or vague requirements.

(3) The capabilities of the fourth generation technical platform

The capabilities of new fourth-generation ICT platforms were at the centre of the investigation within this study. For the purposes of investigation the DotNetNuke platform was used. The usage of ready made and configurable modules and given that the framework is possible to administrate without any programming intervention, make it feasible to develop technical prototypes to explore the capabilities of different pieces of functionality. It should, however, be noted that the ICT outcome

may not only be used for illustration purposes, but can also be put to use in an implementation setting. Hence, the deployment of a complete and technical ICT platform does necessarily require comprehensive technical knowledge or programming competence. As the study shows programming skills may still be needed though. The requirements on the application form could not be fully supported by a ready-made module alone. A tailored piece of functionality was therefore called for that was then integrated and used together within the portal framework and other components.

Concluding remarks

Through a concrete case involving the practical design of a working technical prototype, it is possible to show that a MET institution such as MMU can have a central place in furthering competence development within the knowledge cluster through the usage of ICT. A number of concluding remarks may be put forward together with suggestions for future research:

- Applying the notion of knowledge cluster and using, for example, Porter's (1998) diamond model enables a systematic analysis of situated opportunities as well as challenges in regard to a particular sector of maritime industry. As illustrated in this case, such analysis can be argued to support well-founded decisions in regard to, for example, investments in a particular ICT technology and can also provide concrete guidance to an ICT design process. The capabilities of ICT are becoming increasingly richer and more flexible, and it is an interesting future research area how the maritime educational environment can appropriately integrate ICT within its knowledge cluster.

- It is important to include both social and technical concerns when developing technology to support Maritime Education and Training. Doing so ensures ICT support that is both usable from a technical point of view and useful in an organizational and industry context. It can, however, be recognized that system design approaches, including XP, have been predominately developed

and used within a western context. More research is needed on how these approaches may work in for example Myanmar and other countries.

- Fourth generation ICT platforms open up new possibilities to implement working ICT support. It can be argued that maybe especially for a developing country, such technologies may enable an easy and affordable approach to leverage the capabilities of advanced and modern ICT support. As a developing country, Myanmar is already making efforts to develop ICT and technical infrastructure under the guidance of the government, but there is still a big gap compared with developed countries. In this regard, a platform such as DotNetNuke may work as an enabler of both new system development ventures but also new organizational forms such as network or virtual organizations. It should, however, be emphasized that technical competence may still be needed both for tailored development and maintenance purposes.

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APPENDICES

Appendix 1 Myanmar shipping industry factor condition

According to the UNCTAD Review Maritime 2007, the real GDP growth rates of Myanmar have been regularly increasing from 1994-95 to 2005-06 in terms of percentages except during 2004 and 2005. This shows that Myanmar is developing rapidly compared to other South-East Asian countries (see table 1). Regarding national products the ADB Report (2008), records that trade and transportation, which are the major driving forces in the development of the maritime industry, represented the second largest sector in Myanmar[11].

Table 1: Real GDP growth of selected Asian economics, 2005-2007 (Percentages)

	1994–1995	1995–1996	1996–1997	1997–1998	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003	2003–2004	2004–2005	2005–2006
South-East Asia	8.3	7.4	4.1	-8.3	3.8	6.3	2.2	4.8	5.4	6.2	5.4	5.9
Brunei Darussalam	3.0	1.0	3.6	-4.0	2.6	2.8	3.0	2.8	3.8	1.7	3.0	3.8
Cambodia	5.9	4.6	5.7	5.0	12.6	8.4	5.5	5.2	7.0	7.7	7.0	9.5
Indonesia	8.2	7.8	4.7	-13.1	0.8	4.9	3.8	4.4	4.7	5.1	5.6	5.5
Lao People's Dem. Rep.	7.5	6.9	6.9	4.0	7.3	5.8	5.8	5.9	5.8	6.9	7.3	7.6
Malaysia	9.8	10.0	7.3	-7.4	6.1	8.9	0.3	4.4	5.4	7.1	5.3	5.9
Myanmar	6.9	6.4	5.7	5.8	10.9	13.7	11.3	12.0	13.8	5.0	4.5	7.0
Philippines	4.7	5.8	5.2	-0.6	3.4	4.7	3.0	4.4	4.5	6.0	5.1	5.4
Singapore	8.0	8.2	8.3	-1.4	7.2	10.0	-2.3	4.0	2.9	8.7	6.4	7.9
Thailand	9.2	5.9	-1.4	-10.5	4.4	4.8	2.2	5.3	7.0	6.2	4.5	5.0
Timor-Leste	9.5	10.8	4.1	-2.1	-35.5	13.7	16.5	-6.7	-6.2	1.8	3.2	-1.6
Viet Nam	9.5	9.3	8.2	5.8	4.8	6.8	6.9	7.1	7.3	7.8	8.4	8.2

Source: UNCTAD (2007)

Obviously, to measure the marine industry in Myanmar, the shipping and port performances are two key aspects that reflect maritime development. Firstly, in the shipping aspect, more than 146 shipping companies operate in Myanmar as NVOCCs or Freight Forwarders (Business, 2003). UNCTAD 's Review of Maritime Transport 2004 reported that on average over 50% of the exports of 42 Asian countries went to Asian countries (i.e. intraregional trade) in 2003, 70 % of

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[11] http://www.adb.org/Documents/Books/Key_Indicators/2008/pdf/mya.pdf

Myanmar's exports went to Asia and 95 % of the imports came from there (UNCTAD, 2004).

According to the yearly Central Statistics Organization of Myanmar (Organization, 2009), almost 85% of Myanmar imports are from 6 major countries, namely China, Singapore, Thailand, India, Malaysia and Japan, with 75% of the exports also coming from these nations.

Secondly, port involvement in shipping is an important role. In Myanmar, there are 9 ports, 4 of which are run by State-owned companies, 3 of which are managed by private companies with the remainders being joint ventures. The government is the only landlord of all the ports. The total cargo handling rate has increased year by year from 8,545,048 (mt) in 1996 to 12,003,103 (mt) in 2006, handled by Yangon Port which is 90% of the total cargo to and from Myanmar[12].

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[12] http://www.mot.gov.mm/mpa/seaborne_stat.html

Appendix 2 Registered seafarers in Myanmar

Sr. No.	Type of seafarers	No. of seafarers
1.	Master (F.G)	779
2.	Chief Mate (F.G)	1,477
3.	Officer In charge of a Navigational Watch (F.G)	4,455
4.	Master (Near Coastal Voyage)	87
5.	Chief Mate (Near Coastal Voyage)	463
6.	1st Chief Engineer	641
7.	2nd Chief Engineer	988
8.	3rd Engineer	3,039
9.	Electrical Engineer	1,503
10.	Junior Engineer	3,129
11.	Rating	49,649
	Total	**66,210**

Source: Examinations System.ppt (2009)[13]. Department of Marine Administration Yangon: Author.

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[13] Department of Marine Administration: DMA-Examinations_System.ppt (2009) approved by Academic Dean, Myanmar Maritime University