

MODELLING VIABLE BUSINESS PROCESS FOR INFORMATION
TECHNOLOGY POLICY MANAGEMENT

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To my beloved mother, wife and daughter

ABSTRACT

Information and Communication Technology (ICT) policy is a code that clarifies the duties, responsibilities and rights of technology stakeholders and specifies acceptable and efficient ICT utilization. ICT policy life cycle encompasses four main processes which are: development, implementation, monitoring and evaluation. In many cases, the processes that form the life cycle of ICT policy usually stopped or failed at starting phase(s), including the case study in this research. Failures in ICT policy management may compromise ICT security, control and strategy in addition to incurring unnecessary expense. This study explored the challenges and issues in managing ICT policy in one of the Malaysian Public Institutions of Higher Education. Qualitative research and case study method were utilized to provide greater insight into this complicated phenomenon. An in-depth analysis and elaboration was performed using Viable System Model (VSM) and Hermeneutics method to diagnose and identify weaknesses, mismatches and viable requirements. Subsequently, a business process model for ICT policy management is proposed in order to resolve the diagnosed problem. The model combined the perspectives of systemic functions and organizational structure of VSM with organizational processes and entities (Business Process Modeling, BPM). The application of VSM accommodated environmental dynamism, encouraged sustainable development and provided a sound theoretical platform. In combination with BPM, emphasis shifted from a specific, isolated policy domain to a business process model designed to manage overall ICT policy. An ICT policy management prototype was also developed based on the model. The model and prototype system have been verified through the case study. The thesis provided mechanisms in the form of a business process model and prototype system to facilitate, guide and improve ICT policy management.

ABSTRAK

Polisi Teknologi Maklumat dan Komunikasi (ICT) adalah kod yang menjelaskan kewajipan, tanggungjawab dan hak-hak pihak berkepentingan teknologi dan menentukan penggunaan ICT yang boleh diterimapakai dan efisien. Kitar hayat polisi ICT merangkumi empat proses utama iaitu pembangunan, pelaksanaan, pemantauan dan penilaian. Dalam banyak kes, proses yang membentuk kitar hayat dasar ICT biasanya terhenti atau gagal pada fasa permulaan, termasuk kajian kes dalam penyelidikan ini. Kegagalan dalam pengurusan polisi ICT boleh menjejaskan keselamatan, kawalan dan strategi ICT disamping penanggungan perbelanjaan yang tidak diperlukan. Penyelidikan ini meneroka isu dan cabaran dalam menguruskan polisi ICT di salah satu Institusi Pengajian Tinggi Awam Malaysia. Penyelidikan kualitatif dan kaedah kajian kes telah digunakan untuk memberi gambaran yang lebih jelas tentang fenomena yang kompleks ini. Analisis dan penjelasan terperinci telah dilaksanakan menggunakan *Viable System Model* (VSM) dan kaedah Hermeneutik, untuk mendiagnosis dan mengenalpasti kelemahan dan ketidakpadanan dengan keperluan VSM. Kemudian, model proses niaga bagi pengurusan polisi ICT dicadangkan dalam usaha untuk menyelesaikan masalah yang telah didiagnosis. Model ini menggabungkan perspektif fungsi sistemik dan struktur organisasi VSM dengan proses dan entiti organisasi (*Business Process Modeling, BPM*). Penggunaan VSM menyediakan persekitaran dinamik, menggalakkan pembangunan lestari dan menyediakan satu platform teori yang mantap. Dengan pergabungan BPM, penekanan beralih daripada polisi domain tertentu kepada satu model proses niaga yang direkabentuk untuk menguruskan polisi ICT secara keseluruhan. Satu prototaip pengurusan polisi ICT juga telah dibangunkan berdasarkan model tersebut. Model dan sistem prototaip telah disahkan melalui kajian kes. Penyelidikan ini menyediakan mekanisme dalam bentuk model proses niaga dan sistem prototaip bagi memudahcara, memberi panduan dan menambahbaik pengurusan polisi ICT.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Information and Communication Technology (ICT) is a powerful tool that helps organizations to participate in the global market by promoting political accountability, improving service delivery and enhancing opportunity development. In today's world in which ICT is considered as an enabler in business, and where organizations take competitive advantage from their ICT, organizations need to unlock the power of technology and align their ICT to the business objectives in order to compete. However, though organizations are increasingly spending on ICT, there is a long history of ICT failures or at best mitigated successes. Schwalbe (2006) reveals that organizations need to improve the way ICT is invested and exploited. In other words, marketers cannot exploit ICT unless the right ICT infrastructure and development take place to meet the demands of the users (Lee Goi, 2008). Therefore, one element of having strategic ICT aligned with business goals is to standardize, direct and control the operation of the currently installed technology in order to detect the need for improvements, upgrades or changes. Thus, a mechanism is essential to ensure that ICT investments and operations are effective, efficient and acceptable. Innovative, well-formulated and successfully implemented ICT policies have the potential to provide effective and efficient mechanisms in order to standardize, direct and control the technology and its development and exploitation. A detailed explanation and interpretation of the topic (ICT policy) forms the basis of this chapter.

This chapter provides an introduction to the research study of ICT policy. The chapter demonstrates the steps and pathways to subject formulation. It indicates the study's motivation by highlighting the significance and issues of the topic (ICT policy) using conducted researches and published literature. Eventually, the study's objectives and contribution are specified to provide an overview of the research outcome.

1.2 Importance of ICT Policy

It is identified and verified throughout this study that "ICT policy" has attracted little attention among academicians and practitioners. Therefore, it is necessary to recognize and acknowledge the significance(s) of ICT policy which also reflects the importance and motivation of this research work. Consequently, this section represents the impact various scholars have had on ICT policy formation.

The Australian Standard for Corporate Governance of ICT (2008), AS8015, defines corporate governance of ICT as "The system by which the current and future use of ICT is directed and controlled". It involves the directing and evaluating of ICT plans to support, organize and monitor ICT use in order to ensure the plans success. ICT governance includes ICT strategy and policies for using ICT within an organization (Calder, 2008). However, policy is the instrument of strategy (Unit, 2004) and nowadays organizations cannot compete without ICT strategy (Rodgers, 2002). This argument points to policy intervention as an inclusion issue (Mochrie, 2005). Therefore, an ICT policy is the instrument to execute a strategic ICT plan which directs and controls an organization's ICT. In other words, ICT governance is mainly achieved through ICT policy. ICT governance is also a subset of "Corporate Governance" which can be accomplished by means of positioning a deliberate plan of action to guide activities and decisions, and achieve rational outcomes (Peter Weill, 2004). An ICT policy also backs up ICT vision (Chini, 2008), and supervised implementations are needed to assist in reaching organizational goals, objectives or visions. It is important to include ICT vision as explanatory factors in the assessment of different policy, especially in the case of ICT (Galit, 2004).

ICT goes hand-in-hand with economic growth, and that is the motivation with which ICT policy should be considered (Galit, 2004). For instance, in the early 1980s, South Korea introduced and delivered on a national development policy entitled “One Family One Telephone” (Reynolds, 2005). By 2005/2006, South Korea led the world in the digital opportunity index and had reached the level of high-income countries (Brown, 2008). Additionally, ICT policy is a constituent of knowledge society that encompasses social, ethical and political dimensions; it seeks to ensure ICT is put into service that enables rather than disables (Mansell, 2008, Bindé, 2005). Different aspects of ICT policy empower different stakeholders and that is how ICT can contribute to society empowerment and emancipation (Stahl, 2008).

ICT policy is also a crucial element of academic computing (Mokhtar and Alias, 2006). One needs a certain level of education in order to participate in society and lead a fulfilled life. ICT policy reflects this standpoint using ICT as a lever to improve the provision of education to the citizens (Stahl, 2008). In 2001, Dominica Ministry of Education, Sports and Youth Affairs published a report on ICT policy and identified it as the guide to successful integration of ICT in the education system. ICT policy has the potential to help institutions manage their ICT facilities and resources, provide ICT protection and incentives to users, and guide the community on effective ICT use in learning (Mokhtar and Alias, 2006).

ICT policy mitigates a number of ICT issues including, but not limited to, raising ICT awareness mainly through ICT education and training, the provision of advice as well as the support of ICT use and infrastructure development (Hawkins, 2002). ICT infrastructure refers to an ICT environment in which academic computing is implemented (Mokhtar, 2005), and ICT policy encompasses ICT infrastructure (Mokhtar and Alias, 2006). In other words, ICT policy is an underlying structure (infrastructure) which ensures the proper guidance of different ICT-related services (Mashinini, 2008). Therefore, ICT policy is an ICT infrastructure that supports other ICT infrastructure components. It has multiple goals such as improving ICT quality, efficiency, security, legality and ethics. For these reasons, it is regarded as a means of ICT control and standardization (Kalika, 2007). In fact, ICT policy is very crucial because the potential of ICT depends on how it (ICT) is used (DeSanctis, 1994).

1.3 ICT Policy Challenges and Issues

At this point, it is worth noting the ICT policy issues and challenges that have potentially appeared as a result of the problem background. ICT policy issues and challenges also provide insights and motivation into this research work. Although the current ICT policy researches have been conducted in different countries from different continents such as Africa and Europe, they more or less reflect common issues and challenges. According to the current literature on ICT policy, identified ICT policy issues and challenges appear to exist in developed countries such as Egypt, South Africa, Greece, Sweden and France. Therefore, this section represents and highlights ICT policy issues and challenges using available academic literature. However, names of the countries are not used at this point due to the similarity and commonality of ICT policy issues and challenges within and between these countries. Omission of the names of these countries may also eliminate repetition, redundancy and loss of the main focus.

ICT policy issues and challenges have been discussed as follows: (1) One of the significant shortcomings or issues that can be identified with current ICT policy is that it is mostly uninformed and revolves around the everyday lives of citizens and their ICT perspectives or perceptions (Olsson, 2006). Olsson also claimed that (2) the evaluation of ICT policy success are often times merely in the form of computer and internet access statistics. These data are not sufficient for evaluating ICT policy effectiveness (Raboy, 1998). They require closed examination with consideration of day to day situations (Moores, 2000). In fact, this is the point where ICT policy becomes problematic (3) Olsson mentioned that ICT policy does not take full responsibility for vision. Oftentimes, authorities pass the responsibility to the users once computer and internet access are disseminated. Therefore, according to the author (4) an ICT policy does not survive an encounter with the users for whom it is made. In other words, there is often a difference between the designers or decision-makers of ICT policy and the community's ICT perception (Kalika, 2007).

However, there are arguments about how to strengthen ICT policy initiatives (Mansell, 2008) because (5) current ICT policy is mainly developed with either

minimum or no consultation with affected people, and that is the foremost reason for the policy to not take into account the requirements of the community (Mashinini, 2008). In other words, one ICT policy identified issue is an incompletely formulated ICT policy, especially in support of all the stakeholders. Therefore, not everybody benefits equally from ICT in such conditions of power imbalance, which indicates that the ICT policy is very weak (Olatokun, 2008). Subsequently, (6) the result is that ICT policy is not reflecting the needs and interests of the people, who in turn do not use them (Olatokun, 2008). In sum, (7) ICT policy mostly lacks a strong human development emphasis in order to extend modern ICT services for everybody's benefit. For instance, developed ICT policy mostly covers technical aspects or addresses some stakeholders only (such as decision makers), but not the users and their actual requirements. That is mainly due to the lack of ICT utility focus, licensing delay, slow ICT policy implementation and fixation on ICT business ownership (Brown, 2008). Hence, (8) it is not only that empowerment and emancipation are not achieved but the primary aim of the policy in the first place is also not met. The concept of empowerment and emancipation is particularly important in development which cannot be achieved through (9) seeing community as passive rather than active participants (Stahl, 2008). Eventually, it is argued that articulating ICT requirements unclearly, lack of implementation strategies and identification of user acceptability are due to managers' insufficient ICT skills (Love, 2004). It is common practice in many countries to blame governments for considering ICT policy very low on the agenda, or for lacking an explicit ICT policy (Liagouras, 2010).

Moreover, there are other issues that negatively affect ICT policy management such as (10) low level community literacy, (11) lack of ICT awareness, (12) inadequate results produced by current ICT programs, (13) inadequate ICT infrastructure, (14) inappropriate ICT policy formulation (Mashinini, 2008), and (15) under-estimation of ICT policy political implications by considering ICT policy as unambiguous and technical. Therefore, policy makers often rely on very poor, inaccurate, incomplete and outdated data (Olatokun, 2008). As a result, lack of capacity, inappropriate leadership and roles recognition create challenges that lead to failure in ICT policy implementation. In fact, both the ICT policy itself and the implementation are inadequate when all stakeholders are not involved in the ICT policy development process. However, policy design has its own challenges in terms of levels, instruments

and dynamics (Choung *et al.*, 2011). Other ICT policy challenges are mainly: (1) to implement ICT policy since it is a complex process and influenced by various agents at different levels and scales (Christina, 2011), (2) to implement the ICT projects and management of the organization on the ground, (3) to adjust policy over time (Choung *et al.*, 2011), (4) to scan the environment to ensure user satisfaction or needs fulfillment in order to add value to the community (Mashinini, 2008), (5) to scrutinize policy documents on an ongoing basis (Krauss, 2009), (6) inappropriate or inadequate ICT investments and (7) to give greater attention to measures supporting more differentiated information or knowledge societies (Mansell, 2009). Consequently, this research work attempts to provide guidelines and tools to manage and improve ICT policy formulation, implementation, monitoring and evaluation of the organization.

1.4 Background of ICT Policy Problem

It is necessary to identify the background of the problem that has led to all existing ICT policy issues and challenges. In fact, ICT issues and challenges are potentially founded by the current and relevant requirements or shortcomings. Therefore, this section discusses the main rationale and motivation of this research work. The background of the problem is discussed from the very root (Corporate Governance) up to the main focus (ICT policy).

The concept of Governance has only recently entered the field of social science (Jessop, 1998) and the topic of Corporate Governance is ill-defined and blurred (Nigel, 1994). However, after years of research efforts and publications there are still unconsidered aspects. With regards to ICT governance (the sub-set of Corporate Governance) there have been several frameworks formulated and published by practitioners based on the experience, some of which have been used by industry and became standards. To name a few, the two most widely used or globally accepted ICT governance frameworks are ITIL and COBIT. However, the aforementioned and other available ICT governance frameworks excluded certain aspects such as ICT policy (Reza, 2010).

Although the current ICT policy researches are conducted in different countries, the analysis provides insight into international ICT policy analysis as some of the countries are among the world's leading nations in ICT and most advanced in ICT policy making (Olsson, 2006). The analysis revealed requirements for further political efforts in shaping the new ICT into a civic tool (Olsson, 2003), which addresses and leverages the conditions, effectiveness and appropriateness of ICT policy because it cannot be left entirely to the citizens (Olsson, 2006). Many countries are currently facing the difficult task of formulating the national ICT policy development framework that could enable and benefit equally all stakeholders (Olatokun, 2008). In addition, there is neither a clear ICT strategy nor explicit ICT plan to address ICT as a policy arena in many cities (Galit, 2004). However, when analyzing the policy document in detail there is a lack of sincerity in including all aspects and stakeholders, which betrays dealing with potentially empowering use of technology (Stahl, 2008). In fact, current ICT policy literature is fragmented and does not cover several important points (Mochrie, 2005).

In 2003, The Ministry of Communications and Transport of the United Republic of Tanzania published a report on ICT policy and declared the challenges in ICT policy as finding mechanisms for coordinating policy and creating awareness. In 2005, "Towards Knowledge Societies", a world report published by UNESCO clearly indicated the absence of a model to ensure that ICT development is performed in an enabling rather than disabling manner (Bindé, 2005). It is also stated that further research into user acceptance, adoption and implementation of ICT policy is needed because these ICT policy issues have received very little attention (Kalika, 2007), especially the interplay of two different governance levels of ICT policy (Chini, 2008). Therefore, a relevant and flexible framework is required to address the major challenges of (1) leadership for integration of ICT policy initiatives, (2) culture of compliance with policy, (3) user requirements and value adding, (4) appropriate needs analysis, and (5) ICT policy implementation strategy guiding the policy development process and ensuring the success. A flexible policy framework is necessary to provide a route map to guide the process of the policy development life cycle to ensure effective service delivery and accommodate environmental dynamism (Mashinini, 2008). Mansell (2008) argued that research is needed that develops methodological and theoretical approaches focusing on the communication process dynamically, and involving power

relationships with regards to community empowerment. According to him, a useful forward-looking research framework is required to encourage sustainable development and the embedded values in ICT policy. High priority ICT policy research work that embrace the concern for “power of peace and tolerance” and contribute to debate aim to uncover all elements of stakeholders’ interest. However, the research has to move beyond simplistic and dualistic thinking and address barriers and opportunities for systematic bottom-up policy formation and implementation (Mansell, 2008).

Choung *et al.*, (2011) claimed that technology standards are an important policy issue for managing the evolution of new technologies due to their impact on innovation and diffusion. The authors stated that many have studied different aspects of standards-setting by developed countries, but similar literature on developing countries is lacking. According to the authors, although technological catch-up in the East Asian Newly Industrialized Countries has been explored at length, standards, standards-setting and policy integration for standards have been somewhat neglected and there is no literature that particularly discusses adjustment of standards policy along with technology or industrial policy. Besides, in order to enable multi-channel access, problems concerning standardization and interoperability are not yet sufficiently solved (Melanie and Maria, 2011). Melanie and Maria, however, stated that governance and policy modeling in governmental settings require at least multi-disciplinary approaches, where the same issue is studied by different disciplines while each discipline uses its own perspectives and methods. The authors’ claimed that “there is a crucial need for future research in the field of ICT for governance and policy modeling to overcome the boundaries of traditional disciplines”. Hence, in order to achieve an integrative combination of disciplines they recommend future research in this field to synthesize broad perspectives, knowledge, skills, interconnections, and epistemology. According to Melanie and Maria, this integrative approach should allow the use of methods and the insights of several established disciplines and traditional fields of study for optimal gap closure. Therefore, authors concluded that defining a private-public business model is quite important. They recommended that in order to convince people that service designs are valuable it is necessary to start at the business model level.

Additionally, Yannis *et al.* (2012) argued that most governments worldwide do not as yet have any policy-making or modeling tools. They claimed that ICT tools to

support governments to design policies are not often adopted successfully, and collaborative governance is developing without an appropriate reference framework, which according to the authors is due to the fragmentation between academic fields, application areas and approaches to innovation. Therefore, in this context, one of the research challenges that should be addressed in the long-term perspective is to set the foundations for the new proposed scientific domain through formal methods and tools. Yannis *et al.* suggested research should look at instantiating the depth, relevance, effectiveness, consistency of the concepts, models and tools that correspond to the trend of ICT-enabled and participatory governance supported by mass collaboration tools and policy-modeling mechanisms. However, there are also numerous modeling theories but little useful data to validate the models, therefore the concept of policy modeling itself still needs to be further explored and defined. The authors drew the conclusion that we are at the beginning of a long term process, which can also eventually benefit of emerging ICT developments.

Ruben *et al.*, (2012) who conducted their policy research in the educational context of Belgium also stated that in order to facilitate the integration of ICT in education, developing a school-based ICT policy plan is important and researchers and policy makers around the world are increasingly acknowledging its significance. Despite this interest, the authors highlighted that not much is known about how schools can develop their local ICT policy capacity and how to establish an ICT policy plan. The literature on ICT policy planning appears to be underdeveloped (Fishman and Zhang, 2003) and general in nature (Vanderlin *et al.*, 2010), which has also been corroborated by Siew and Su (2010) who confirmed that scientific evidence of the concrete contributions of ICTs to the learning domain is less evident despite the general acceptance that ICT has an important role to play in changing and modernizing educational systems and ways of learning. In addition, existing publications in this domain have generally focused on Western countries (Siew and Su, 2010). Christina (2011) also pointed out the problem that policy documents do not provide descriptive ICT practice guidelines, and schools are required to exercise discretion in interpreting governmental policy. Consequently, questions have been raised such as: will the hierarchical, bureaucratic and centralized constraints of the educational system overrule the individuals' qualities that influence ICT policy implementation (Christina, 2011).

Ruben *et al.* concluded from their study that further research is needed to determine the effectiveness and sustainability of an ICT policy.

According to Mansell (2009) there are unequal power relationships among stakeholders in ICT policy debates as well as signs of learning and awareness of this fact, which may contribute to a shift in priorities towards a more context sensitive research framework. The author reflected on the UNESCO world report statement and restated that there are no ready-made off-the-shelf models of the information society that can be adopted to ensure ICTs are developed and used in enabling ways. Therefore, there is a need to renew efforts to critique the values embedded in ICT policies and practices in order to counter those which privilege technology and foster a narrow set of market-led values. In effect, the research community needs to foster a sustainable development rethinking in the context of information or knowledge societies and the role of ICTs within that context. The aim must be to ensure that ICTs are deployed in enabling ways where people become empowered to make choices. Research is needed informing all stakeholders about the ways in which varying combinations of information and communicative relationships in local and global contexts can contribute to sustainable development, focusing on the dynamics leading to effective learning systems (Mansell, 2009). Zaffar (2009) conducted his research in the context of Pakistani education and suggested that to overcome this situation, there is an utmost need for a robust, effective and target-oriented ICT policy and that action must be taken in a timely manner. He proposed conducting a bigger and full length study in the future that can identify problems and provide solutions on a global level.

However, Chini (2008) claimed that analysis will fail to trace historical interdependencies if specific ICT policy is treated independently and shifted the focus to an ideological study of policy documents from material arrangements to policy implementation. Therefore, further ICT policy research needs to clearly investigate identities, forms of visibility, techniques and government purposes. Eventually, failure at the policy level reflects important shortcomings in technology and innovation conceptual framework (Liagouras, 2010). Thus, an ICT policy management framework is required (Reza, 2010), which features important contributions from the United Nations Charter in 1945 and the Universal Declaration of Human Rights (UN UDHR) in 1948 that obliged all states to establish, protect and enforce human rights at the

global, regional and local levels (Montiel, 2007). Therefore, ICT policy has the potential to empower and emancipate people through tackling the power imbalance and making everybody benefit equally from ICT.

Eventually, it can be concluded from the discussions of this section that the background problem of ICT policy is that there are no guidelines or an appropriate reference framework or business model. This problem is intensified by inadequate publications in this domain. Therefore, this study focuses on a number of issues in ICT policy domain. In general, the research attempts to guide the process of the policy development life cycle (i.e. development, implementation, monitoring and evaluation) to ensure effective service delivery. There are considerations taken into account while formulating the solution, such as: user requirements and value adding, appropriate needs analysis, and ICT policy implementation strategy guiding the policy development process and ensuring the success. This work dynamically develops methodological and theoretical approaches focusing on the communication process, involving power relationships with regards to community empowerment. However, through the application of Viable System Model (VSM) the study focuses on the interplay of different governance levels. With reference to chapters two and three, the application of VSM also accommodates environmental dynamism, encourages sustainable development and provides a sound theoretical basis (one of the main concerns of scholars and practitioners is to find a mechanism to validate the models in this domain).

1.5 Prioritizing ICT Policy Research Indicator and Context

There are different opinions among scholars on which context or indicator must priority be given in future ICT policy researches. In other words, whether the highest priority should be given to developing countries or all countries should be considered in order to take into account what is practical to achieve (Mansell, 2008). However, it is argued that the aim of people emancipation and empowerment is universal. Therefore, it can be applied to western and non-western environments (Stahl, 2008). On the other hand, research has shown that ICT policy initiatives fail if it is made general among different countries (Liagouras, 2010). According to Krauss (2009), the need to establish

viable and theoretical guidelines on ICT for development practice is consistently highlighted. He also claimed that ICT theories, strategies and technologies established in developed countries cannot necessarily be transferred to developing contexts, and assumptions about their applicability should be questioned. This implies a need to contextualize ICT for development, test the impact of ICT implementation and question the assumptions and value of ICT policy and guidelines in the specific cultural-context. Thus, the community sector has to be recognized in order to achieve sustainable ICT initiatives (Huggins, 2002).

ICT policy research priority is to be given to the context that is actively engaged with people's everyday lives and preoccupies the material conditions of the community's life (Mansell, 2008). However, organizations need to have access to a framework in order to successfully integrate a technology management style into their current corporate governance (Love, 2004). Therefore, organizations need to develop their ICT policy and strategy frameworks (Labelle, 2005) as a guide in determining their own implementations (Dawson, 2006). This has also been pointed out by Choung *et al.* (2011) that "another possibility is the conflicts in different organizations' objectives reflecting on their short or long term scope". An ICT policy framework developed for an organization may not be fully applicable or adoptable to other organizations, but comparison of several frameworks can potentially result in introducing a more comprehensive one accepted in a wider context (Reza, 2010).

1.6 ICT Policy in Malaysian Public Institutions of Higher Education (MPIHE)

As discussed in the previous section, future ICT policy researches are to be conducted in both developing and developed countries and it is for this purpose that Malaysia has been selected. It has also been identified that every organization needs to have a framework in order to achieve ICT sustainability. However, high priority should be given to the context actively engaged with and preoccupying the material conditions of a community's everyday life. Thus, the higher educational context has been chosen to conduct this research work. Higher education plays a very important role in our everyday life, generating information and knowledge (Mokhtar, 2005). However, an

overview of Malaysia and her higher education with consideration of ICT deployment is provided next.

Abdullah (2002) stated that Malaysia's ICT position among Asia Pacific countries ranks as medium. Therefore, ICT integration and deployment level into higher education is neither high nor low. However, with the launch of the "Multimedia Super Corridor" project in 1995, the government has laid down a strong foundation to grow and expand ICT industry to achieve Malaysia Vision 2020. The project provides great ICT development emphasis and the country's economic growth through a number of benefits (e.g. development of ICT intelligent cities, unrestricted employment of knowledge workers and national ICT agenda development). Abdullah also claimed that despite government efforts Malaysia's ICT industry is faced with various challenges such as: shortage in skilled professionals, lack of entrepreneurial ICT talent to develop innovative world-class technology and products, and absence of agreement on using appropriate ICT research methods. He also stated that the study of ICT in Malaysia is relatively new, with no long research tradition. Lee Goi (2008) somewhat pointed out the same issues. He stated that a number of studies show that development and adoption of ICT in Malaysia is among the highest in the Asian countries. However, Lee argued that the dotcom situation in Malaysia is merely getting started and keeping pace with the technology changes, lack of qualified ICT staff and resistance to change by users are the other problems currently existing (Lee Goi, 2008). Suhaimi *et al*, (2012) indicated that Malaysia is facing the challenges of demand-supply gap in terms of a quality ICT related workforce. In other words, there is a lack of sufficiently trained and experienced ICT graduates, which in the future can negatively influence the ICT policy management of an organization. Zaffar (2009) categorized the diverse set of problems that higher education systems around the whole world face. According to him, problems faced by the developed world are: interdisciplinary, global responsibility, and sustainable development. Problems that the less developed world face are: growth in enrollments, institutional development, governance, poor and uneven distribution of ICT resources and infrastructure, high cost of the sustainability of technology due to exceptional and multifaceted ICT growth, defining ICT role for organizational transformation, making ICT responsive to the organizational vision and mission, and developing a non-systemic method of ICT implementation. Therefore, Zaffar claimed that ICT integration in education needs proper attention, mechanism and policy.

In addition, MPIHE play an important role in achieving and supporting the objective of the country's vision by producing knowledge workers (Finance, 2002). However, researches conducted among the MPIHE shows: (1) the need for comprehensive survey to identify clusters and patterns in academic computing implementation (Mokhtar, 2005) and (2) the need for specific methodology containing a systematic description in formulating knowledge, information and ICT strategic plan (that can be used as a guideline to knowledge management implementation) (Sirajuddin, 2005). According to Sirajuddin, the methodology should list all the steps, tasks and techniques used to answer the question of what, when, where, who and how a knowledge management strategic planning documentation can be prepared. This also covers the ICT policy arena since ICT policy can be viewed from the knowledge management perspective (Labelle, 2005). Policy and strategic management also play an important role in ensuring the community's participation in the knowledge management program (Mohayidin, 2007). Sirajuddin stated other MPIHE challenges in knowledge management are the lack of expertise in formulating knowledge management strategic plan, financial constraints, low level of knowledge sharing culture and lack of policy in motivating workers to share and use knowledge. Therefore, he concluded that due to improper management of available data, information and knowledge, many Malaysian universities are not utilizing knowledge to their fullest capacity in order to improve their performance. As a result, knowledge generation, utilization and sharing is not performed efficiently (Mohayidin, 2007).

On the other hand, the Malaysian Administrative Modernization and Management Planning Unit (MAMPU) published an ICT strategic plan guide for Malaysian public agencies in 2003 which, however, does not address ICT policy management. Consequently, ICT policy management of MPIHE is not at the satisfactory level. In other words, many ICT policies have been developed but very few implemented, monitored and evaluated (Reza, 2010). Furthermore, this research's case study had the lowest score among other MPIHEs for knowledge management parameters in enhancing the organizations performance (Mohd Ghazali Mohayidin, 2007). The case study also faces difficulties in implementing ICT policy due to the lack of guidelines (Technology, 2007), poor ICT policy dissemination and low ICT policy awareness (Reza, 2008).

1.7 Statement of the Problem

This study intends to come up with an approach to provide insights into ICT policy management. The research question is: “**How can an ICT policy be managed in order to ensure effective service delivery and ICT sustainability?**” However, the following issues need to be addressed as a pre-requisite in order to answer the main question.

- i. What are the suitable and necessary tool(s), technique(s) and method(s) for the analysis of ICT policy management?
- ii. What are the challenges and issues in ICT policy management?
- iii. Who are supposed to be involved in ICT policy management and what are their roles and responsibilities?
- iv. What are the procedures, activities and processes in ICT policy management?

1.8 Objective of the Research

The main goal of the study is to develop and propose “**A Viable Business Process Model that provides a guideline to ensure effective service delivery and achieve ICT sustainability**”. In order to achieve the above goal, below is the list of objectives that need to be achieved:

- i. To determine appropriate tool(s), technique(s) and method(s) for conducting ICT policy research analysis.
- ii. To identify challenges and issues in ICT policy management.
- iii. To identify appropriate roles and responsibilities, activities and processes in ICT policy management.

1.9 Scope of the Research

The scope of this study is as follows:

- i. The subject domain is restricted to ICT policy analysis and management.
- ii. The under-research or case study is one of the Malaysian Public Institutions of Higher Education.
- iii. The business process model is only verified in the case study.
- iv. ICT policy management prototype system is part and parcel of the model (partially automates the model) and it is also used as a mechanism to verify the proposed business process model.

1.10 Organization of the Thesis

The thesis consists of seven chapters. Each chapter is briefly described below:

- i. Chapter one describes the importance of the study, problem background, problem statement, objective and scope.
- ii. Chapter two illustrates the three areas of ICT policy, VSM and Business Process Modeling (BPM).
- iii. Chapter three presents the steps and methodology utilized in accomplishing the study.
- iv. Chapter four articulates the analysis of the case study.
- v. Chapter five introduces the proposed business process model.
- vi. Chapter six demonstrates the prototype system.
- vii. Chapter seven provides discussion, characteristics of the proposed solution, research limitation, achievement and future direction.

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