
ICT Integration in Education System of Korea, Singapore and Hong Kong: Applying for Thailand

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Abstract

Globalisation has shrunken our world into a single, large global community at frighteningly fast pace. Those who are not able to catch up with it could be worryingly left behind. Therefore, it consequently creates a widening gap between developed and developing countries. Endogenous growth theory suggests that internal knowledge creation and research development policies enable poorer nations to escape poverty traps and richer nations to maintain their growth in a sustainable fashion. Arguably, governments of leading nations have enthusiastically sought ways to fuse Information and Communication Technology (ICT) with pedagogical activities to create knowledge and equip their citizens to build skilful human capital. Evidently, those nations who have successfully done so are doing rather well and are able to stand at the forefront of the global community, such as Korea, Singapore and Hong Kong. This paper looks into case studies of how these three nations have successfully adopted and integrated ICT into their pedagogical activities and also examines common characteristics among the main actors, such as their Ministries of Education, school directors and teachers in schools through our evaluation framework. Finally, this paper also provides recommendations of how Thailand could adapt and adopt such strategies into their own integration.

Keywords: ICT-integration to pedagogical activities, endogenous growth theory, educational development

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การบูรณาการเทคโนโลยีสารสนเทศและการสื่อสารในระบบการศึกษาของประเทศ เกาหลี สิงคโปร์ และฮ่องกง: การนำมาประยุกต์กับประเทศไทย

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บทคัดย่อ

ในสถานการณ์ปัจจุบันที่เทคโนโลยีได้เข้ามามีบทบาทกับการพัฒนาในทุกด้านของประเทศ อีกทั้งทฤษฎีการเติบโตทางเศรษฐกิจแนวใหม่ได้ยืนยันว่า การที่ประเทศจะก้าวผ่านพ้นกับดักในการพัฒนาประเทศนั้น ทรัพยากรมนุษย์เป็นปัจจัยสำคัญที่รัฐบาลแต่ละประเทศควรมุ่งพัฒนา เป็นที่แน่ชัดว่า ประเทศที่ทำการบูรณาการเทคโนโลยีเข้ากับการเรียนการสอนที่ประสบความสำเร็จและมีประสิทธิภาพนั้น ย่อมสามารถนำพาประเทศให้เจริญก้าวหน้า โดยการพัฒนาทรัพยากรมนุษย์ของตน เช่น สิงคโปร์ เกาหลีใต้ และเขตปกครองพิเศษฮ่องกง บทความนี้ได้ทำการศึกษาโดยการเปรียบเทียบเชิงวิเคราะห์เรื่องการบูรณาการเทคโนโลยีเข้าสู่การเรียนการสอนในห้องเรียน โดยวิเคราะห์จากบทบาทที่สำคัญของรัฐบาล ผู้บริหารโรงเรียน และโรงเรียนของทั้งสามประเทศข้างต้น โดยใช้เค้าโครงทางทฤษฎีเพื่อดูทั้งบริบทด้านวัฒนธรรม และบริบทด้านโครงสร้าง เพื่อหาข้อเสนอแนะให้กับรัฐบาลของประเทศไทยเพื่อนำไปพัฒนาด้านการศึกษาต่อไป

คำสำคัญ: การบูรณาการด้าน ICTa การพัฒนาทางการศึกษา ทฤษฎีการเจริญเติบโตทางเศรษฐกิจแนวใหม่

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Introduction

Globalisation is a process by which our world has gradually shrunken into single, large global community across many aspects such as economics, socioeconomics, culture and even education. With the help of Information and Communication Technology (ICT) such as the Internet, blogs and wikis, the process has been significantly expedited. The phenomenon has introduced a tremendous amount of developmental promise across multiple dimensions, such as, for instance, poverty eradication, trade barrier reduction, reduction in inequalities, and a minimisation of gaps between the haves and the have-nots, although it failed miserably in many ways as well (Stiglitz, 2002). Paradoxically, the gaps between the haves and the have-nots have instead widened. Moreover, those who are unfamiliar or inexperienced with technology to access relevant information so as to catch up with an ever-changing world are rapidly left behind. Undoubtedly, this impact is also felt strongly within education systems and urges many nations to pursue an educational paradigm shift. As much for its indirect intercultural effects as its obvious facilities for cutting across physical boundaries and geographical distances to link people around the world, ICTs are thus increasingly recognised as a key organising vehicle for various notions of globalisation and imperatives of internationalisation in education (Davis, 1999).

ICTs will get rid of geographical barriers allowing learners to access knowledge at their own pace and in their own time as proposed by a lifelong learning paradigm. Moreover, ICT enables children and teachers to create, store and share knowledge with no physical boundaries (Loveless & Dore, 2002). The use of ICT in education is being accepted globally as a requirement of future social and economic development, as well as a basis for potentially improving access to education through distance learning methods of online provision (Richard, 2004). Moreover, ICT can potentially bring about higher-order thinking when appropriately integrated with pedagogical activities in the classroom (Jonassen & Carr, 2000; Kearney & Treagust, 2001; Oliver & Hannafin, 2000).

Ministry of Education (MOE) of Thailand, the government entity with the highest annual fiscal budget (Thailand Ministry of Finance [MoF], 2012), has also invested significant amounts in providing ICT infrastructures in schools, especially through stimulus program (SP2) since 2009 and One Tablet Per Child policy in 2013. However, the way MOE has spent the budget on ICT infrastructure acquisition has not necessarily been effective nor transparent and has no clear pedagogical direction.

Unlike developed countries that have successfully integrated the use of ICT in their classrooms, such as Singapore, Hong Kong and Korea, Thailand does not have a concrete ICT master plan guiding how schools could effectively deploy this infrastructure to yield the optimal pedagogical results. Even worse, schools have acquired ICT equipment with no real aims and

with very little benefits being realised. It is clear from elsewhere in the world that ‘technocratic’ policies focusing on a mere access to computers and top-down change are not sufficient in themselves to lead to integrated practices of technology usage in education, let alone to transform educational practices and paradigms (Richard, 2004; Burbules & Torres, 2000; Cuban, 2001). Additionally, Richard (2004) contends that to integrate ICT in learning and pedagogical activities, it is not solely about infrastructure acquisition. According to Endogenous Growth Theories, countries that accumulate more human capital (H) and extensively invest in research and development (R), like the three aforementioned countries, are more likely to sustain growth or even to accelerate it over time when compared to nations that accumulate these inputs at a slower rate (Cypher & Dietz, 2009). Therefore, the Government of Thailand should pay closer attention to how it should effectively invest in human capital development. Moreover, it should drastically enhance its education systems through ICT integration in order to sustain that development.

Therefore, the aim of this paper is to pay close attention on how important actors; such as the Government of Thailand and especially its ministry of education (MOE), school directors and teachers, play their part in such a pedagogical revolution. Optimistically, MOE of Thailand could adopt and adapt its policies to support such changes by using development models and case studies from Singapore, Hong Kong and Korea. One of many reasons why these three countries are chosen as a development model is that they are consistently ranked highly in PISA results through the help of their successful ICT integration in their education systems (Lim, 2007; Lee, 2003; Fox & Henri, 2005). Moreover, the three countries share similar pedagogical characteristics and societal values that play an important role in cultural contexts and teaching and learning models (Richard, 2004). On a smaller scale, school directors can provide sufficient support in terms of positive reinforcement, leadership and training while teachers should get rid of their ICT anxiety and should be familiarised with technology to ensure such positive changes (Tondeur et al., 2009). The questions this paper aims to address are:

- What are the critical success factors of the successful ICT integration in pedagogical activities in Korea, Singapore and Hong Kong?
- What was the role of each participant in the process to increase the success rate of ICTs integration to pedagogical activities?
- Can Thailand adopt, adapt and apply such models to increase its own success rate? If not, what can be done to change the status quo?

The methodology adopted in this paper is qualitative comparative analysis (QCA) mostly from secondary sources. Three case studies from three different countries are carefully and thoroughly reviewed to identify critical success factors through deploying an evaluation framework developed after some literature is carefully studied. In the last section, a more

general and well-substantiated list of critical success factors will be proposed for ICT integration to pedagogical activities in Thailand.

Literature Review: Endogenous Growth Theories; ICTs and the Interplay of Pedagogical, Institutional and Social Contexts; and ICT Integration to Classroom Evaluation Framework

“...The more you learn, the faster you learn things were important sources of the reality that growth seems to have been speeding up for more than a century instead of slowing down as had been expected by Solow-model. In knowledge was the source of increasing returns, then accumulating more of it should mean faster growth” (Warsh, 2006: 207)

Endogenous Growth Theory suggests that the limit to growth can be practically deferred. In the Neoclassical Growth Model, given an existing production function, a nation can only grow to a certain level before diminishing returns would lead to contraction (equilibrium - K_N in Figure 1). Only through exogenous technological change, which increases productivity of all nations equally, can output be increased further. However, experience provides ample evidence to the contrary as nations are observed to grow at significantly varying rates. Endogenous growth models account for these observed differences in growth by differentiating between nations based on technological change and knowledge that are built internally, that is, endogenous to or within nations. This internal knowledge can be fostered through a *learning-by-doing process* and is mutually transferred from one person to another through *spill over* effects at a macro level. In most endogenous growth models, the three most important factors are: the initial stock of human capital, the rate of accumulation of human capital, and the research capital that will help to create knowledge. Moreover, knowledge can also help poorer nations to escape poverty-traps and richer nations sustain their stellar growth (Cypher & Dietz, 2009).

Endogenous growth models also suggests that government policies can greatly affect the rate of long-term economic growth by impacting the accumulation of both physical and human capital. In addition, government can drive innovation by enacting policies that support research and development, resulting eventually in long-term economic development (Cypher & Dietz, 2009).

It is rather clear from the beginning that integrating ICT into pedagogical activities will, to a certain extent, bring benefits to child development. ICT can expedite the learning process and encourage lifelong pedagogical paradigms. It is believed to be an essential means to reforming teaching and learning models from a traditional teacher-centred paradigm to a lifelong learning one (Jonassen & Carr, 2000; Richard, 2004). However, the integration process itself is very complex and far from autonomous, even after a budget is allocated to acquire the requisite infrastructure. Rather, the integration of ICT must be the result of an interaction

between pedagogical, institutional and social imperatives of educational ‘culture change’ as shown in Figure 1 (Richard, 2004).

The diagram proposed by Richard (2004) demonstrates how three entities-institutions, society, and teaching and learning models - interact with one another. In Thailand, *educational institutions* are still very much identified with top-down discipline, meaning pedagogical activities will only be shaped through management or MOE direction. It is very unusual that teachers in local schools take initiative to come up with their own learner-centric lesson plans. Moreover, Thai *society* is still very traditional when it comes to cultural and educational contexts such as seniority in society and in schools. As a result, societal norms and values are profoundly embedded in how knowledge is usually transferred from teachers to learners; a *teacher-speaks-student-listens model* is still very common in schools. The relationships amongst the three entities with the Thai context leads to an institutional imperative and learning culture in education that tends to focus on ICT in isolation as a new medium or set of learning tools, not as a means to transferring knowledge. This new teaching tool overwhelmingly frightens most teachers as it is perceived as a substitute for face-to-face teaching (Daniel, 1996). Richard (2004) also proposes an alternative for teachers to view ICT as a new everyday applied literacy to minimise ICT anxiety as shown on the right box in Figure 2.

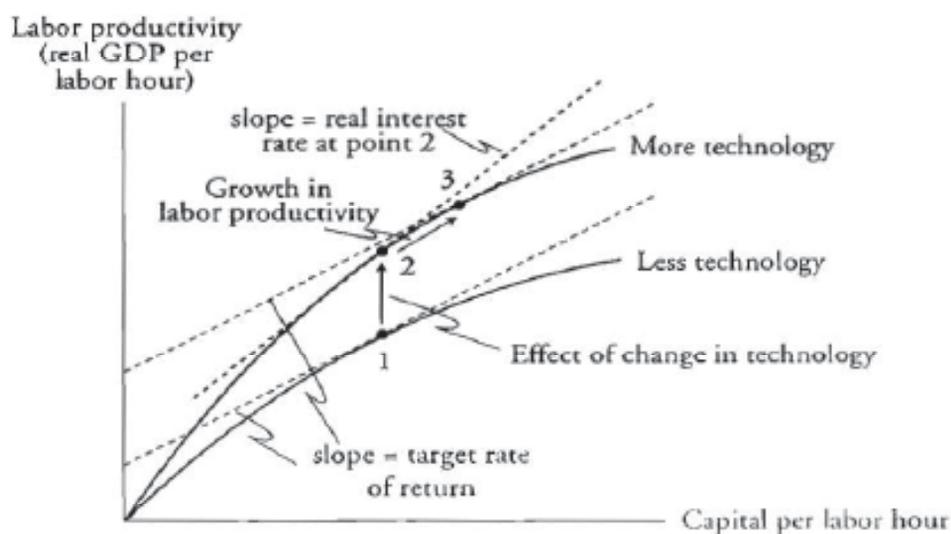


Figure 1. An Endogenous Growth Production Functions (Cypher & Dietz, 2009).

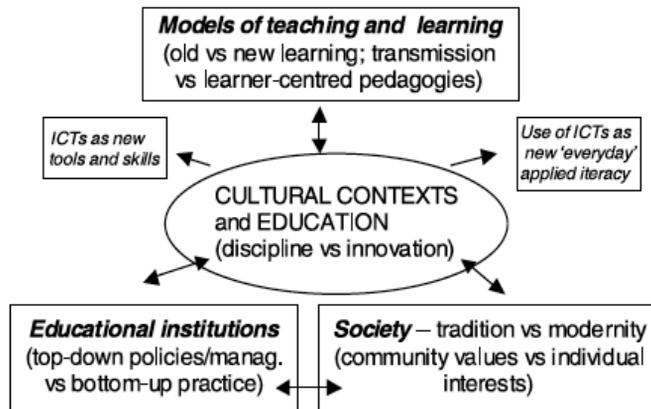


Figure 2. ICTs and the Interplay of Pedagogical, Institutional and Social Context (Richard, 2004).

As discussed above, ICT integration into pedagogical activities is very much concerned with cultural aspects, it would therefore be naïve to simply view the integration process as a structural/technocratic one. Therefore, Tondeur, et al. (2009) have ostensibly identified a framework consisting of two distinct components: structural and cultural characteristics.

Structural Characteristics are split into three sub-components: ICT planning including aspects of evaluation and cooperation, ICT-related support, and the availability of infrastructure (Tondeur et al., 2009). Strategic ICT plans that set clear goals and define the means by which these goals can be realised will result in a more sophisticated ICT integration (Brydeup & Kowalski, 2002). Moreover, to ensure a more effective ICT integration, comprehensive assessment and evaluation approaches are required to obtain current ICT use in schools (Kennewell, Parkinson & Tanner, 2000). The last but most obvious sub-component--the availability of infrastructure--is very much clear in itself as schools that already have infrastructure put in place will be more prepared for ICT integration.

Cultural Characteristics are plainly identified by Tondeur, et al. (2009) as consisting of the three following sub-components: innovativeness, goal orientedness and leadership. Innovativeness is the teacher's attitude towards educational innovations and how agile they are towards change and educational innovations. Goal orientedness is the extent that common goals are shared amongst members and that school vision is clearly formulated. Leadership is the degree to which school directors engage in supportive behaviours. To ensure the success of ICT integration into pedagogical activities, we must take into account all of these factors, including the integration of and interrelation between government policy, individual institutional vision, history and established culture, teaching philosophy and approaches, curriculum and examination issues, restrictions and limitations, change management strategies, community support

and practices of individuals, and teacher-student motivation and abilities and most significantly, clear and committed leadership at all levels (Fox & Henri, 2005).

Moreover, a simple focus on teacher characteristics could lead to “individual blame” rather than “system blame” when focusing on explaining variables related to ICT integration (Tondeur et al., 2009). This paper would like to redefine the word “system” from what was previously mentioned in Tondeur, et al. (2009); Ministry of Education will be included. The reason being school directors are still very much dependent on MOE as a parent educational institution. Therefore, the following framework is proposed to identify critical success factors of ICT integration in the three countries.

Table 1. ICT Integration to Pedagogical Activities Evaluation Frameworks.

Criteria/Actors	Minister of Education	School directors	Teachers
Cultural Characteristics			
Innovativeness	Actor’s attitude towards educational innovations and how agile they are towards change and educational innovations.		
Leadership	How much actors engages in supportive behaviour.		
Goal Orientedness	The extent that common goals are shared among members and that educational institution’s vision is clearly formulated.		
Structural Characteristics			
ICT Policy Planning	Strategic ICT plans that set clear goals and define the means to realise these goals. The plan is shared and understood amongst actors.		
ICT Support	ICT related support are in place and actors know when and where to seek or provide supports.		
Infrastructure	Infrastructures are promptly in place.		

In the following section, three case studies will be thoroughly discussed and carefully appraised against the framework proposed above. Details of each actor will be thoroughly analysed and comprehensively compared to eventually extract critical success factors, which will be summarised in the discussion and analysis section when we try to apply them to the Thai context.

ICT Integration Initiatives in Korean Education¹

The introduction of ICT into the Korean education system began in the 1970's when computers were first introduced into its school systems. Only in 1987 did the Ministry of Education in Korea start to integrate the use of ICT into its curriculum through its Master Plan for Education Reform. The process was then expedited by the establishment of the Ministry of Information and Communication in 1994 to implement informatization more effectively at the national level. The Informatization Promoting Committee under the leadership of the prime minister was established in 1996, proposing 10 major tasks, including Educational Informatization. The continuous efforts of the Korean government to effectively integrate the use of ICT into the classroom are clear through the various projects aimed at refining the ICT integration implementation plan every year since 1998. The main objective of this policy is to enhance teachers and students ability to utilise ICT in pedagogical activities.

The efforts to integrate ICT into classroom solutions can be classified into four basic areas (Korea Education & Research Information Service, 2001);

- Building information infrastructure
- Strengthening ICT education
- Teacher training for ICT use
- Development and dissemination of educational digital contents

The task was originally scheduled to be complete in 2002 but was pushed by the prime minister. As a result, it was accomplished two years earlier than originally planned. The reason for the hastening was, among other things, due to the urgent notion that educational reform through ICT integration could not be slowed by procrastination and to the fact that the Seventh National Curriculum was to start in 2000. This actually demonstrates a strong commitment from the head of state in ICT integration. The achievements of the four areas are summarised in the table below:

¹ The section is mainly from literature review of Lee, M.G. (2003). *Comparative Analysis of ICT Integration Initiatives in Korean, German and American Educations*. Retrieved March 2011 from [www.medienpaed.com /-02-2/lee.1.Pdf](http://www.medienpaed.com/-/02-2/lee.1.Pdf).

Table 2. The Four Tasks to ICT Integration to Pedagogical Activities in Korea.

Tasks	Achievements
Building information infrastructure	<ul style="list-style-type: none"> • Distribution of computers to teachers and students. • Installation of multimedia equipment and construction of computer network enabling the Internet use at school. • In 2000, every school already had at least one computer lab in school and every classroom had a computer with Internet access and multimedia equipment. • Government negotiated with relevant parties to ensure the lowest price possible for schools.
Strengthening ICT education	<ul style="list-style-type: none"> • This can be categorized into two areas; <ul style="list-style-type: none"> Information literacy: students can enrol as extra curriculum to equip themselves with ICT skills and to familiarise with it. Utilization of ICT within curriculum: it became compulsory starting from the first grade of elementary school that more than 10 percent of classroom instruction/learning make use of ICT in every subject from the year 2001 onward. • A systematic evaluation process was put in place to identify and ICT literate students.
Teacher training for ICT use	<p>This can be roughly divided into four main activities:</p> <ul style="list-style-type: none"> • ICT training for in-service teachers. • Encouraging study-groups for ICT integration into subjects. • Activation of contests for teachers' ICT use. • Introduction of an ICT skill certification system.
Development and dissemination of educational digital contents	<ul style="list-style-type: none"> • EDUNET, a national education information server, was established as a knowledge management and information sharing amongst teachers all over the country. • To encourage educational content development, many positive reinforcements were enacted e.g. contests and competitions. • Government showed strong commitment to develop and disseminate educational software by organising exhibition and to certify educational software developer.

To analyse relevant actors with our proposed frameworks, the analysis is summarised in the table below:

Table 3. Summary of ICT Integration in Korea.

Criteria/Actors	Criteria/Actors	Criteria/Actors
Cultural Characteristics		
Innovativeness	<ul style="list-style-type: none"> • MOE headquarter initiates policies that support new technology and/or bring about new technology to the country. The strong commitment is clearly shown by the prime minister who's the head of the state. 	<ul style="list-style-type: none"> • The fact that the integration was successfully implemented and even completed before the original timeline, it could roughly imply that the school directors are very agile to change.
Leadership	<ul style="list-style-type: none"> • National policies are clearly enacted i.e. budget for ICT training, positive reinforcement is initiated from MOE headquarter. • Competitions are widely used to promote the use of ICTs integration. 	<ul style="list-style-type: none"> • Teachers were excited with new technology and all activities introduced by MOE. • Teachers are agile to change and rather adaptive to technology however there are some problems as technologies were utilized at schools was much lower than expected at first due to the integration was hurried through. • Teachers take initiatives to integrate ICT into their curriculums.
Goal Orientedness	<ul style="list-style-type: none"> • ICT master plan is clearly outlined. • The fact that the plan was completed two years earlier than the original plan demonstrates a high degree of goal orientedness. • Collaboration amongst the two ministries, MOE and Ministry of ICT also play an important role in the success of the integration. 	<ul style="list-style-type: none"> • Common goals are shared amongst teachers and members. • Approximately 25 percent of all teachers had participated in various forms of training as of 2000. Further, from 2001, the plan was extended to 33 percent of all teachers every year.

Table 3. Summary of ICT Integration in Korea (continued).

Criteria/Actors	Criteria/Actors	Criteria/Actors	Criteria/Actors
Structural Characteristics			
ICT Policy Planning	<ul style="list-style-type: none"> There's a very clear set of planning to integrate ICT into curriculum and pedagogical activities i.e. The Implementation Plan for Promoting Educational Informatization in July 1996, Master Plan for Informatization Promoting. 	<ul style="list-style-type: none"> The chronic competitive nature of schooling in preparation for college entrance makes the situation. 	<ul style="list-style-type: none"> Teachers understood the plan. Technologies were utilized at schools was much lower than expected at first due to the plan was rushed through the original plan without prior scrutiny into its effectiveness in school practices. Teachers' clerical works along with subject teaching are so much that it results in having insufficient time to study for integration of information technologies into their subject matter.
ICT Support	<ul style="list-style-type: none"> A clearly defined support systems were put in place e.g. teacher trainings, negotiation that the government made. 	<ul style="list-style-type: none"> No information. The fact that the integration was successfully implemented and even completed before the original timeline, it could roughly imply that the school directors are very agile to change. 	<ul style="list-style-type: none"> Teachers know where to seek support when needed. Special training for informatization agents was also conducted for a total of 10,000 teachers, one from each elementary and secondary school.
Infrastructure	<ul style="list-style-type: none"> Infrastructure are promptly available: every classroom has a computer and multimedia equipment and every school has at least one computer lab. 		

Source: Author's Own Elaboration

ICT Integration Initiatives in Singaporean Education²

According to Lim (2007), the Singaporean government had also planned the integration of ICT into the classroom quite effectively. The first master plan for ICT in Education (MP1) was enacted in April 1997. The main goal of this master plan was to ensure that schools integrated ICT in their curriculums successfully. In so doing, the government expected to foster the development of a culture of thinking, lifelong learning, and social responsibility. Four key dimensions of the ICT master plan were identified: curriculum and assessment, learning resources, teacher development, and physical and technological infrastructure. There were three phases in MP1: Phase 1 in 1997, Phase 2 in 1998 and Phase 3 in 1999.

During the first phase, schools that had strong ICT backgrounds were chosen to be demonstration schools. They provided other schools with concrete, local models on innovation in teaching and learning strategies, and in school administration using ICT. As a result, ICT was fully integrated to all subject areas in the primary school, secondary schools and junior college levels. There was extensive use of the Internet, digital content and classroom management systems. During these activities, ICT was employed to facilitate the shift of learning from information receiving towards finding, collating and synthesizing relevant information that fits into a lifelong learning pedagogical paradigm. Not only did learners effectively learn the contents, but they also developed soft skills such as teamwork, problem solving and communication. During this phase, ICT was also found to be very helpful for students with weaker performance as it allowed them to learn at their own pace.

MP1 provided a strong steppingstone for schools in Singapore to be able to fully integrate ICT into their pedagogical activities. The main finding from Phase 1 discovered by Lim (2007) is:

- Phase 1 schools in MP1 demonstrated significantly higher use of ICT in the classroom among students and teachers. They also showed greater opportunities for staff development and a more conducive ICT culture than Phase III schools.
- Independent-autonomous schools have significantly higher teacher and student use of ICT for teaching and learning than government-aided schools
- The correlation among the management of ICT resources, student use of ICT, teacher use of ICT, staff development and school ICT culture was significant and highly positive

In 2002, MP2 was developed to ensure that the achievements from MP1 were sustained, as the integration in Singaporean schools had reached a considerable level of maturity and stability (Lim, 2007). Findings from the study conducted in 2004 regarding MP2 are summarized in the table below.

² This case study is mainly from Lim. (2007). *Effective Integration of ICT in Singapore Schools: Pedagogical and Policy Implications*, Education Tech Research Development 2007. 83-116.

Table 4. Finding of Singapore ICT Integration Master Plan (MP2) (Lim, 2007: 98).

Categories	Units of information
ICT tools	<p>Funds allocated to schools for ICT resources (interviews with teachers)</p> <p>Masterplan for ICT in education: teacher-computer ratio of 2:1 and pupil-computer ration of 6.6:1 (Ministry of Education website)</p> <p>Adequate ICT resources: Data projector, desktop computers, educational software (observations, documentation, and interviews with teachers)</p>
Disciplinary rules	<p>Display of rules in the computer room (observations)</p> <p>Briefing of rules and procedures by teachers (interviews with teachers)</p> <p>Rules and procedures in action in the computer room (observations of ICT-mediated lessons)</p> <p>Rationale of rules and procedures (interviews with teachers and pupils)</p>
Educational rules	<p>Step-by-step demonstration of ICT tools (observations of ICT-mediated lessons, and interviews with teachers and pupils)</p> <p>Worksheets to support use of ICT tools (observations of ICT-mediated lessons, and interviews with teachers and pupils)</p> <p>Checklists to support use of ICT tools (observations of ICT-mediated lessons, and interviews with teachers and pupils)</p>
Division of labor among participants	<p>Teachers working with weaker pupils (observations and interviews with teachers)</p> <p>Teachers guiding pupils in the learning tasks (observations and interviews with teachers and pupils)</p> <p>Technology assistants (TA) address technical problems faced by teachers and pupils (Observations and interviews with teachers)</p> <p>Some teachers attempt to address the technical problems themselves and will ask the TA for help when they cannot handle them (Observation s and interviews with teachers)</p> <p>Pupils are assigned different roles: group and assistant group leaders to collect and distribute ICT resources (Observation s and interviews with teachers)</p> <p>Some pupils are appointed ICT representatives and help teachers to troubleshoot or setup the ICT equipment (observation s and interviews with teachers)</p>

From the background of the findings about how Singaporean governments integrated ICT into their educational systems discussed above, we can apply our evaluation framework as shown in the table below.

Table 5. Summary of ICT Integration in Singapore.

Criteria/Actors	Ministry of Education	School directors	Teachers
<p>Cultural Characteristics</p> <p>Innovativeness</p>	<ul style="list-style-type: none"> MOE headquarter initiates policies that support new technology and/or bring about new technology to the country. The strong commitment is clearly shown when the government developed MP1 in April 1997 and again MP2 in 2002. MOE provided a space on in Internet for teachers to discuss and exchange ideas on how to integrate ICT in classroom. 	<ul style="list-style-type: none"> School directors are welcome the integration into their schools. School directors encourage teachers to share their best practices for the integration. School directors always upgraded their infrastructure so that teachers would not run into technical problems. 	<ul style="list-style-type: none"> Teachers participated in best-practice sharing session to learn from each other. From the study, teachers were very agile change, ICT integration. Teachers were firstly afraid but became cooperative later on.
<p>Leadership</p>	<ul style="list-style-type: none"> National policies are clearly enacted i.e. budget for ICT training, positive reinforcement is initiated from MOE headquarter. Government funded quite a few researchers to explore the most effective way for the integration. 	<ul style="list-style-type: none"> Policies are strongly committed in school levels. School directors developing school policies to minimise barriers of the integration e.g. providing laptop for teachers so that they can familiarise with ICT anytime that want. Teachers assistants are provided to enhance teaching and learning values in schools as teachers have to focus on weaker students. 	<ul style="list-style-type: none"> A buddy system was initiated so that teachers who are familiarised with ICT can help new teachers.

Table 5. Summary of ICT Integration in Singapore (continued).

Criteria/Actors	Ministry of Education	School directors	Teachers
Cultural Characteristics			
Goal Orientedness	<ul style="list-style-type: none"> • ICT master plan is clearly outlined. • The fact that MP2 was initiated in 2002 to follow up and ensure that the integration was going according to MP1. 	<ul style="list-style-type: none"> • School vision and integration plan are clearly formulated and shared. 	<ul style="list-style-type: none"> • National and schools policies are welcome to enhance pedagogical activities.
Structural Characteristics			
ICT Policy Planning	<ul style="list-style-type: none"> • There's a very clear set of planning to integrate ICT into curriculum and pedagogical activities i.e. MP1 in April 1999 and MP2 in 2002. • However, exam oriented curriculum can be a true obstacle to ICT integration due to the fact that teachers are pressured to heavily focus on how to get students into good universities. 	<ul style="list-style-type: none"> • School directors engaged in translating national policies into school policies for the optimal integration result. 	<ul style="list-style-type: none"> • Teacher act as practitioners though disciplinary and educational rules and procedures are set by teachers for ICT usage in the classroom i.e. no computer game was allowed.
ICT Support	<ul style="list-style-type: none"> • Significant budget were allocated for teacher trainings and infrastructure procurement. 	<ul style="list-style-type: none"> • School directors initiated industry-teacher partnerships to deliver just-in-time ICT training for students and develop instructional ICT-mediated materials for teaching and learning. 	<ul style="list-style-type: none"> • Teacher act as a facilitator and could focus more on weaker students.

Table 5. Summary of ICT integration in Singapore (continued).

Criteria/Actors	Ministry of Education	School directors	Teachers
<p>Goal Orientedness</p>	<ul style="list-style-type: none"> • Since MP1, infrastructure was adequately put in place for 368 schools by the end of 2002. Computer availability ratio between teacher-computer is 2:1 and between pupils-computer is 6.6:1 for primary schools. • The schools were also given fund to purchase software and other peripheral annually with their own authority to select and purchase what's best for their teachings. 		

Source: Author's Own Elaboration.

ICT Integration Initiatives in Hong Kong SAR Education³

“We will launch a five-year IT education strategy to promote the use of IT to enhance teaching and learning. Within five years, we are aiming to have teaching in at least 25 percent of the curriculum supported through IT. Within ten years, we aim to see IT being applied comprehensively in school life, and all our teachers and Secondary five graduates being able to work competently with IT tools” (Tung, 1997: 46-47)

The classroom integration of ICT in Hong Kong started in 1998. The then five-year master plan was established to make sure that the integration was going to occur successfully. The Hong Kong Government allocated 3.05 billion Hong Kong Dollars (around 400.6 million USD) to procure ICT infrastructure such as hardware, software and technical support as well as five years of technical teacher training. The aim of such support from the government was to change the teaching paradigm from teacher-centric to learner-centric (Fox & Henri, 2005).

Another interesting characteristic of the Hong Kong experience stems from the self-perception among teachers of being “small potatoes”. Teachers who identified their own roles as very limited to classroom instruction and scoring provision also played a very passive role in the ICT integration. Consequently, teacher influence beyond individual classrooms was limited as was their recognition of the need for broader professional development (Fox & Henri, 2005). As a result of such perceptions, the school director’s role in providing leadership and innovation became critical, requiring a clear vision of ICT integration into pedagogical activities.

In the beginning of the ICT introduction into classrooms, it was merely used to convey knowledge e.g. power point slides were prepared instead of writing on a blackboard and teaching materials preparation. Therefore, Master of Science in Information Technology in Education (MSc [ITE]) in the Faculty of Education at the University of Hong Kong was invented to support teachers who were not familiar with ICT usage in classrooms. The aim of this course is to equip teachers with knowledge on how to utilise ICT within classrooms, including design, develop, evaluate, implement, and manage the use of ICT at various educational levels and settings. The course was part-time study and offered a flexible modular structure enabling participants to progress according to their own pace, while still teaching in their schools (Fox & Henri, 2005). After the class, teachers were asked to post their responses, feedback and their coursework into an online-shared space. There were over 200 teachers enrolled in this course by the end of 2002. The summary of the findings is appraised through our evaluation framework in the table below.

³ This section is mainly taken from Fox, R., & Henri, J. (2005). Understanding teacher mindsets: IT and change in Hong Kong schools. *Educational Technology & Society*, 8(2), 161-169.

Table 6. Summary of ICT Integration in Hong Kong

Criteria/Actors	Ministry of Education	School directors	Teachers
Cultural Characteristics	<ul style="list-style-type: none"> Then the five-year master plan was established to make sure that the integration was to successfully happen. 3.05 billion Hong Kong Dollars (HKD) around 400.6 USD- was made available by the government to procure infrastructure such as hardware, software and technical support. Five years plan of technical teacher training was outlined. Master of Science in Information Technology in Education (MSc [ITE]) was invented to help teachers developed ICT skills. An online shared placed was created to encourage best-practice sharing. National policies are clearly enacted i.e. budget for ICT training, positive reinforcement is initiated from MOE headquarter. 	<ul style="list-style-type: none"> Unfortunately, of the 36 teachers interviewed only four considered that their principal had such a vision or such an understanding of how IT could be successfully integrated into the school and into the curriculum. 	<ul style="list-style-type: none"> “Small potatoes” perception of teachers obstruct the innovativeness within classrooms. At first, ICT was merely used as an information transmitter.
Innovativeness			
Leadership		<ul style="list-style-type: none"> Unfortunately, of the 36 teachers interviewed only four considered that their principal had such a vision or such an understanding of how IT could be successfully integrated into the school and into the curriculum. 	<ul style="list-style-type: none"> The majority of teachers identified themselves as “small potatoes” and believed that leadership was the role of the school directors only.

Table 6. Summary of ICT Integration in Hong Kong (continued).

Criteria/Actors	Ministry of Education	School directors	Teachers
Cultural Characteristics			
Goal Orientedness	<ul style="list-style-type: none"> ICT five-year master plan was clearly outlined. 	<ul style="list-style-type: none"> The school directors seemed to be disengaged from supporting roles. 	<ul style="list-style-type: none"> The evidence from this study is that these teachers, despite technical competence, are not equipped to lead. They do not hold a consistent view about what it means to be a teacher, nor do they have the means to judge whether or not a new innovation compliments the existing culture.
Structural Characteristics			
ICT Policy Planning	<ul style="list-style-type: none"> There's a very clear set of planning to integrate ICT into curriculum and pedagogical activities since 1997 However, exam oriented curriculum can be a true obstacle to ICT integration due to the fact that teachers are pressured to heavily focus on how to get students into good universities. 	<ul style="list-style-type: none"> From the findings, school directors still lack supports and vision of how to translate national policies to school level. 	<ul style="list-style-type: none"> Teachers did not have a chance to establish any policies at all due to the small potatoes perception.

Table 6. Summary of ICT Integration in Hong Kong (continued).

Criteria/Actors	Ministry of Education	School directors	Teachers
Structural Characteristics			
ICT Support	<ul style="list-style-type: none"> • Significant budget were allocated for teacher trainings and infrastructure procurement. 	<ul style="list-style-type: none"> • School directors initiated industry-teacher partnerships to deliver just-in-time ICT training for students and developed instructional ICT-mediated materials for teaching and learning. 	<ul style="list-style-type: none"> • Teacher do not therefore exhibit personal ownership of what happens at school or where the school is going; that is someone else's area of expertise and responsibility.
Infrastructure	<ul style="list-style-type: none"> • 3.05 billion Hong Kong Dollars (HKD) around 400.6 USD was made available by the government to procure infrastructure such as hardware, software and technical support as well as. 		

Source: Author's Own Elaboration

Discussion and Analysis: Making Sense of Where We are and Moving forward in Thailand

From findings in the three case studies in Korea, Singapore and Hong Kong, common and similar characteristics are summarised in the table below. Detailed discussion is presented after the table along with recommendations.

Table 7. Summary of ICT Integration Common Characteristics of the Three Countries.

Criteria/Actors	Ministry of Education	School directors	Teachers
<p>Cultural Characteristics</p>	<ul style="list-style-type: none"> • MOE initiates policies that support new technology and/or bring about new technology to the country. • ICT integration to pedagogical activities are all driven and initiated by government in the 3 countries. The first country who brought this change was Korea in 1978. 	<ul style="list-style-type: none"> • School directors should act as mediators who translate national policies into school policies except for school directors in Hong Kong who were perceived as technological challenged. • School directors should encourage teachers to come up with their own disciplinary and rules and procedures for ICT usage in classroom. 	<ul style="list-style-type: none"> • Teachers must think outside the box and should be agile to change. • “Small potatoes” perception should be avoided.
<p>Innovativeness</p>	<ul style="list-style-type: none"> • National policies are clearly enacted i.e. budget for ICT training, positive reinforcement is initiated from MOE. • Supportive policies are also required i.e. competitions and teacher awards. • The government provided fund for researches in the area. • Blogs and online-space should be set up for teachers to share their best practices and discuss difficulties found along the process. 	<ul style="list-style-type: none"> • School directors should act as an immediate support for teachers in terms of knowledge and training or time allocation for discussion and best practice sharing. • Teachers Assistants (TA) are provided in Singapore so that teachers can fully focus on weaker students. 	<ul style="list-style-type: none"> • Teachers should come up with disciplinary and rules and procedures for ICT usage in classroom to make sure that pupils fully engage in pedagogical activities. • Teachers should take initiatives in getting familiarised with ICT. • Teachers should actively engage in curriculum design that has ICT as a teaching tool.
<p>Leadership</p>			

Table 7. Summary of ICT Integration Common Characteristics of the Three Countries (continued).

Criteria/Actors	Ministry of Education	School directors	Teachers
Cultural Characteristics			
	<ul style="list-style-type: none"> The reform needs to involve changes in the curriculum, assessment and the professional development of staff (not limited to just technical training in how to use new technology). 		
Goal Orientedness	<ul style="list-style-type: none"> Creating a shared ICT vision and integration plan to provide school leaders and teachers a vehicle for coherent communication about how ICT could be effectively used. 	<ul style="list-style-type: none"> School directors should formulate school policies from national policies and communicate them out to teachers, students and parents. 	<ul style="list-style-type: none"> Common goals are shared amongst teachers and members. Usefulness of ICT integration to pedagogical should be realised. Act as a change agent to communicate and seek helps from parents if need be.
Structural Characteristics			
ICT Policy Planning	<ul style="list-style-type: none"> A concrete master plan (mostly a five-year plan) must be drawn before the implementation process. Set ICT competency standards for teachers and students. Evaluation and assessment policies for the integration must be put in place. Policies that focus solely on entrance examination and how to get good ranking should be gradually changed. 	<ul style="list-style-type: none"> Schools should allow some contact time for teachers to share their best-practices of how to integrate the ICT into classrooms. Schools directors should act as mediators to translate national policies to school policies. 	<ul style="list-style-type: none"> Teachers should come up with disciplinary and rules and procedures for ICT usage in classroom to make sure that pupils fully engage in pedagogical activities.

Table 7. Summary of ICT Integration Common Characteristics of the Three Countries (continued).

Criteria/Actors	Ministry of Education	School directors	Teachers
<p>Structural Characteristics</p> <p>ICT Support</p>	<ul style="list-style-type: none"> • MOE should prepare budget for a long term training to get the optimal results. • Annual budget should also be allocated to keep ICT equipment up-to-date. 	<ul style="list-style-type: none"> • School directors should constantly provide training and contact with industrial experts. • If budget allowed, teachers should have a laptop to play and get familiarised with ICT as much as possible. 	<ul style="list-style-type: none"> • Teacher should participate in training provided and actively share their best practices amongst teachers. • Teachers may participate in blog or online discussions to provide support for peers.
<p>Infrastructure</p>	<ul style="list-style-type: none"> • Infrastructure must be promptly available to all schools. It seems like the three countries share the same roadmap that is infrastructure must be put in place first. • Annual budget should be allocated for schools to procure the most updated software and other peripherals. Those equipment should be sourced for by schools themselves, not from headquarter. This will increase transparency in the procurement process and ensure that the equipment is sourced according to schools needs. 		

Source: Author's Own Elaboration

There are three critical success factors for the first and most important actor, the government. First, government must actively drive innovation through the various means available to it to integrate ICT into pedagogical activities. Second, government must take a strong leadership role in bringing change into the educational system (all three studied governments initiated their integration plan before the year 2000 particularly the Korean government who did it in 1994). Third, government must have a clear vision with a set of clearly defined goals. From the case studies, all three countries had long-term master plans that drove innovation, provided clear objectives, and created an effective leadership framework for infrastructure acquisition, teacher training, and other supportive activities such as competitions and professional certifications. Some countries provided more active leadership in defining pilot schools to gather feedback before rolling out their models nation-wide. In all cases studied, governments ensured alignment with their long-term vision by institutionalizing their initial achievements within subsequent plans (i.e. MP2). Additionally, all three countries allocated a sufficiently big initial budget to equip schools with adequate infrastructure. They followed this with discretionary annual budgets, administered at the school level to best fit their needs and intended to ensure continued hardware and software updates and maintenance. In some cases, additional budgets were successfully allocated to other supportive activities. For example, the Korean government applied national competitions to render positive reinforcement while the Singaporean and Hong Kong SAR governments provided extra funds for researchers to find optimal solutions for the integration. A shared characteristic among the countries examined, and also in Thailand, that could be a major obstacle to the successful integration of ICT is exam-oriented curriculums. School directors and teachers are pressured by this policy to focus on rankings and how to make their students get the best scores in the country. Therefore, efforts and resources are put into getting good grades rather than ICT integration, which promotes lifelong learning pedagogy. The problem was clearly recognised in the three case studies though there has been no solid solution for it yet. In short, critical success factors for the government are determined innovations, strong leadership and clear goals. The three characteristics will then be translated into concrete policies and sufficient budget for ICT integration to pedagogical activities.

School directors are the second most important actors in the process after we have concrete national policies. Firstly, school directors in the three countries acted as mediators who translated national policies into school policies to achieve the successful ICT integration. For examples, Singaporean school directors contacted outside ICT-experts to provide ICT related training for teachers to familiarise themselves with the new teaching tools. Secondly, supportive behaviours such as extra-time allocation and online space for teachers to discuss about their best practices and exchange tips and ideas in ICT usage with curriculums are required. However, problems arose in Hong Kong where four out of thirty six school directors were perceived as

having resistance to change and were not strong leaders. As a result, teachers and subordinates had a perception of “small potatoes” which limited teacher’s participation in the integration process. On the contrary, school directors in Singapore provided strong commitment to the integration. Supportive actions were genuinely provided, such as providing laptops for teachers so that they could become familiarised with ICT, and providing teacher assistants (TA) in the classroom to help facilitating activities so that teachers could focus on weaker students. The critical success factors for school directors are therefore an ability to translate national policies into school policies, providing supportive behaviours, demonstrating strong leaderships with learning agility and acting as a role model for teachers in schools.

The teacher is the last actor who is very important to the success of ICT integration to pedagogical activities. Indisputably, there would not have been success in the three countries had there not been strong commitment and consistent participation from teachers. In fact, ICT integration in classrooms will occur only if driven by teachers directly. In all the countries examined, with the exception of Hong Kong, teachers were cooperative and adaptive to change when supportive behaviour was provided by the governments and school directors. In Singapore, teachers designed their own disciplinary and educational rules and procedures in their classrooms, demonstrating a strong commitment to the success of the integration. In all cases teachers welcomed and actively participated in provided training to familiarise themselves with the technology and ensure their comfort with it. Extra time was allocated for best practice sharing. Clerical work was minimised, and an effort was made to de-emphasise the perceived and real pressure of performance rankings and university entrance examinations. ICT support and assistance was made readily available when teachers encountered either technical or pedagogical problems during the integration process. In most countries, common goals and vision were shared among teachers while detailed plans were laid out. In Singapore, teachers were empowered by taking part in setting classroom policies, rules and procedures for how students could use ICT in their learning activities. The critical success factors for teachers are therefore active participation in training, engagement in the design and execution of the programs at the classroom level, facilitation and use of knowledge sharing, reduction of clerical load, openness to re-prioritisation of pedagogical objectives and a general emphasis on teacher empowerment to avoid the “small-potato” trap as experienced in Hong Kong.

Recommendations for ICT Integration in Thailand

The first actor is the government. In Thailand there are three separate government entities that do not work harmoniously. They are the Office of the National Education Commission (ONEC), the Institute for the Promotion of Teaching Science and Technology (IPST) and the Ministry of Education (MOE). ONEC, who is an important actor that should drive any education

reform in Thailand, does not state explicitly and does not even have a clear vision of how ICT can be a part of educational reform. They merely mention discernible benefits of ICT in the learning process on their website. The Ministry of Education of Thailand has not yet provided a concrete plan of how ICT can be integrated into pedagogical activities. This government unit seems to be dealing solely with infrastructure acquisition, the effectiveness and transparency of which is controversial. Last but not least, the only government unit that seems to be actively concerned with ICT integration into pedagogical activities is IPST, though they are not a decision maker in educational reform. IPST is a government unit under the Ministry of Education that provides recommendations, conducts research in the educational area, and develops curriculums that are not compulsory for schools to adopt. In 2001, IPST developed an ICT integration master plan called 'Master Plan for Teacher Professional Development in ICT Use in Science and Mathematics, B.E. 2545-2549 (A.D. 2002-2006)'. Since then, there has been no tangible reform in Thailand. Thailand, because of its multiple government actors in ICT integration, lacks the efficiency and effectiveness that other countries like those studied here can enjoy by nature of their more concentrated government leadership. Besides, Thailand has not yet had a true concrete national policy for such reform. From ONEC website, it can be viewed that the benefits of ICT integration are not fully realised in pedagogical activities. Apparently, there is a lack of innovation from the government. Additionally, compared to countries in this study, Thailand has changed its government significantly much more often. Inevitably, a lack of continuity of the Thai government is also an important obstacle to drive the reform in the long run.

Thai school directors, who are supposed to act as mediators that translate national policies to school policies, cannot fully take part in ICT integration process due to the lack of a concrete national policy. Additionally, a strong determination to get their students into good universities and to obtaining higher O-Net scores seems to be taking priority over promoting a lifelong learning paradigm and learner-centric pedagogical activities. As a result, only mathematics and science have been a strong focus of schools, as also driven by the Ministry of Education. As shown in the national curriculum and course structure, ICT is viewed as an optional course and even a burden for both teachers and schools, due to the fact that they need to spend their annual budget on equipment maintenance and additional trainings. Infrastructure is also not readily available to all schools all over the country. Consistent budget allocations from year to year usually only apply to the bigger, better known schools in each province, leaving little room for other schools. In sum, the budget allocation tends to neglect smaller schools outside cities, which can be viewed as a lack of fairness and transparency. Therefore, in order for school directors to fully engage in this reform, a clear national policy and a sufficient and an even-handed budget allocation should be provided.

Last but not the least, at the teacher's level, Thailand still fundamentally lacks teachers in general. A classroom size of 45-50 students is common, and not ideal for an effective learning environment let alone to integrate ICT in pedagogical activities. Not only low quantity of teachers in Thailand is a problem, but also their quality. Generally, teachers in Thailand do not get paid well compared to other countries (lower than 300 US dollars salary). South Korea, for instance, recruits only elite graduates and paying them accordingly (The Economist, September 17th 2011). Besides, The perception of 'small potatoes' is strongly held amongst teachers. Teachers usually follow school director instructions very strictly without questioning causes and real benefits of certain activities. Innovation within the teaching model for Thai teachers is also generally lacking. It is a very uncommon behaviour for Thai teachers to develop lesson plans themselves. They usually opt for off-the-shelf lesson plans and curriculums available in the market, which limit their innovativeness in bringing ICT into classrooms. Teachers also need consistent and effective training to be familiarised with ICT and how they could be integrated into pedagogical activities. In short, teachers need immensely more support from government and school directors to be familiarised with ICT and to have more free time to be able to discuss and absorb this education reform into their thinking. Furthermore, changes in the hierarchical nature of the school administration, leading to a greater acceptance of innovation and independence, will be needed to help drive ICT integration down into the classroom level.

Conclusion

Without doubt, ICT is a useful tool for educational reform and to develop lifelong learning and learner-centric pedagogical paradigms. As suggested by Endogenous Growth Theory, in order for a nation to escape its poverty trap and to sustain long-term economic growth, it needs to effectively and sustainably develop human capital and to promote technological change within the country. However, to have a successful ICT integration into pedagogical activities is a complex process that is far from autonomous. One cannot assume that ICT integration to pedagogical activities will miraculously happen as a result of simply acquiring infrastructure. As we have seen from the three case studies, it requires innovativeness, strong leadership and a top-down goal-orientedness from the government down to teachers/practitioners. ICT policy planning must be clear and an adequate amount of infrastructures must be put in place as well as training. Supportive behaviour from government and school directors is very important for teachers to smoothly and effectively perform the integration. Looking at Thailand, we are still far from achieving anything stated in the ICT master plan developed in 2001. Clearly, some immediate changes must take place. First, a clear set of goals and national policies must be developed and driven by a final decision maker, not merely by a research and development unit. Second, the main focus of schools should be shifted from obtaining higher O-net scores to how learners

synthesise knowledge and how they develop lifelong learning skills. Surely, this is not going to happen overnight, as demonstrated in the case of the Korean government who initially introduced technology into classrooms in 1978. It takes a strong will, an unabated determination and continuous innovation to move the nation forward.

References

- Bryderup, I. M., & Kowalski, K. (2002). The role of local authorities in the integration of ICT in learning. *Journal of Computer Assisted Learning*, 18(4), 469-479.
- Burblues, N. C., & Torres, C. (Eds.). (2000). *Globalisation and Education: Critical Perspectives*. New York: Routledge.
- Cuban, L. (2001). *Oversold and Underused: Computers in the Classroom*. Cambridge, MA: Harvard University Press.
- Cypher J. M., & Dietz J. L. (2009). *The Process of Economic Development*. 3rd ed. New York: Routledge.
- Daniel, J. (1996). *Mega-Universities and Knowledge Media: Technology Strategies for Higher Education*. London: Kogan Page.
- Davis, N. (1999). The globalisation of education through teacher education with new technologies: A view informed by research through teacher education with new technologies. *Educational Technology Review*, 1(12), 8-12.
- Fox, R., & Henri, J. (2005). Understanding teacher mindsets: IT and change in Hong Kong schools. *Educational Technology & Society*, 8(2), 161-169.
- Jonassen, D. H., & Carr, C. S. (2000). Mindtools: Affording multiple knowledge representations for learning. In Lajoie, S. P. (Ed.). *Computers as Cognitive Tools: No More Walls*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Kearney, M., & Treagust, D. F. (2001). Constructivism as a referent in the design and development of a computer program using interactive digital video to enhance learning in physics. *Australian Journal of Education Technology*, 17(1), 64-79.
- Kennewell, S., Parkinson, J., & Tanner, H. (2000). *Developing the ICT Capable School*. London: RoutledgeFalmer.
- Korea Education & Research Information Service. (2001). *Information and Communications Technology in Education*. Seoul: The Education & Research Information Service, The Ministry of Education & Human Resources Development.
- Lee, M. (2003). *Comparative Analysis of ICT Integration Initiatives in Korean, German and American Educations* Retrieved March, 2011 from www.medienpaed.com/02-2/lee1.pdf.
- Lim, C. P. (2007). Effective integration of ICT in Singapore schools: pedagogical and policy implications. *Education Tech Research Development*, 55(1), 83-116.

- Loveless, A., & Dore, B. (2002). *ICT in the Primary School*. Buckingham, MK: Open University Press.
- Oliver, K., & Hannafin, M. (2000). Student management of web-based hypermedia resources during open-ended problem solving. *The Journal of Educational Research*, 94(2), 75-92.
- Richards, C. (2004). From old to new learning: global imperatives, exemplary Asian dilemmas and ICT as a key to cultural change in education. *Globalisation, Societies and Education*, 2(3), 337-344.
- Stiglitz, J. (2002). *Globalization and Its Discontent*. New York: W. W. Norton & Company, Inc.
- Thailand Ministry of Finance. (2012). *Five years average (2008-2012) of Government of Thailand Budget Allocation*. Retrieved October, 2015 from <http://dwfoc.mof.go.th>.
- Tondeur, J., Devos, G., Van Houtte, M., Van Braak, J., & Valcke, M. (2009). Understanding structural and cultural school characteristics in relation to education change: The case of ICT integration. *Education Studies*, 35(2), 223-235.
- Tung, C. H. (1997). *Building Hong Kong for a New Era, Address by the Chief Executive at the Provisional Legislative Council Meeting on 8 October, 1997*. Toronto: Canada-Hong Kong Resource Center.
- Warsh, D. (2006). *Knowledge and the Wealth of Nations: A Story of Economic Discovery*. New York: W.W. Norton & Company.