

# National Innovation System: an account of Thailand

Sachdeva, Megha\*

*\*Management Discipline Group  
University of Technology Sydney, Building 5B, Quay St, Sydney, NSW 2135, Australia  
(megha.sachdeva@uts.edu.au)*

## Abstract

The study of National Innovation Systems (NIS) is quite recent and Lundvall suggested a first integrated framework in 1988. Most of the previous studies on NIS examine the roles, interactions of various institutions such as government, universities, private firms, financial intermediaries to study the NIS of a nation. Whilst discussing the attributes of NIS and analysing the Thai innovation system the systematic problems of the Thai NIS are explored. A framework is presented which mainly focuses on building the capabilities of Thailand to increase its economic performance.

**Keywords:** National innovation system, Thailand, innovation framework, political instability, capability building

---

## 1. Introduction

Innovation is one of the foundations for developing a competitive advantage of an economy (Great Britain Treasury, 2000). Whilst focusing on the extensive capabilities of Asian economies that developed due to industrialisation, the focus has moved from agricultural economies to strengthening and upgrading opportunities for diffusion of innovation and enabling technological capabilities. The movement of industrialisation experienced by countries such as Japan and East Asian NIEs<sup>1</sup> was much later than other Western developed countries. This led Japanese and East Asian NIEs to develop their own national innovation systems based on the developments of the western world. Acquiring new technology where technology is symbolically known as 'manna from heaven' (Lundvall, 1988, p. 360) was understood by Japan and other NIEs but to catch up with the other advanced countries in their technological movement was the main reason for their success.

Within Asia, innovation is a key driver for the transformation of its economies (as cited in Dodgson, 2009; Kim & Nelson, 2000; Lundvall, Joseph, Chaminade, & Vang, 2009). Most NIEs observed the intensive government policies of the western world which supported the building of its innovation capabilities (Intarakumnerd, 2012; Lall & Teubal, 1998), and this became the focus of some countries. For instance, Korea and Singapore relied on the foreign direct investments, where Korea focused on creating *giant private conglomerates* and Singapore targeted the transnational corporations (TNCs) to add high value to its activities (Lall & Teubal, 1998). On the other hand, Taiwan focused on creating indigenous capabilities whilst upgrading small and medium enterprises SMEs. The national vision and strategies of Japan and East Asian NIEs were different in various countries, but all were aimed at building their learning

---

<sup>1</sup> NIEs are known as Newly Industrialised economies which include Korea, Taiwan, Singapore and Hong Kong

capabilities and focused on both the horizontal and vertical priorities (see table 1) in their policies which were formulated, executed and coordinated properly. Both policies – horizontal and vertical focused towards building technology; horizontal priorities concentrated on increasing generic technological activities and vertical aimed at the specific technology, clusters, industries and regions (Intarakumnerd, 2012, p. 35). Unlike the policies as outlined in table 1 which were specific and coordinated and integrated well, the ones articulated and undertaken in Thailand were different. In fact there was no substantial national innovation policy until 2000 in Thailand. Although the word innovation appeared in several national plans, it was not fully integrated in the Science and Technology (S&T) policies of Thailand. From another perspective, it needs to be noted that at one point Thailand, Japan and other NIEs were categorised as latecomers in technological industrialisation where all were at a similar position, however unlike others, Thailand was unable to progress, implement, and meet the technological lag. One of the reasons could be the political instability as Thailand has experienced 12 coups since 1912 and this may be a major reason for the detrimental effect on its economy. Apart from the current political situation, Thailand is still doing better Philippines, Indonesia, and some other Indo-China countries as evidenced by its ratio of total gross expenditure spent in the economy on R&D to GDP where its ratio in 2007 was 0.25 per cent, higher than these other countries (United Nations Development Programme (UNDP), 2009).

**Table 1:** Examples of Horizontal and vertical technology policies in Japan and the NIEs during their catching-up period

Horizontal Policies	Examples
Grants to support R&D in business enterprises	Singapore & Korea
Support to cooperative pre-competitive consortia	Japan & Taiwan
Promotion of technology transfer	Japan & Korea
Broad technology support for SMEs	Japan & NIEs
Vertical Policies	
Subsidization and credit allocation for capital intensive investment	Japan, Korea & Taiwan
Restriction of FDI to build capabilities	Japan & Korea
Targeting strategic technologies for promotion in national laboratories	Japan & NIEs
Targeting enterprises for R&D support in particular technologies	Japan & Korea
Intervening in technology transfer processes to build specific capabilities	Singapore
Providing subsidized credit for upgrading selected activities	Korea & Taiwan
Subsidizing joint R&D by enterprises and institutes in specific areas	Korea & Taiwan

*Source: Intrarakumnerad (2011) based on the summary from Lall and Teubal (1998), pg. 37*

Thailand's focus on its national innovation policy is quite recent as outlined by Chaminade et al. (2012) and Intarakumnerd (2012). While Dodgson (2009, p. 590) argues that rapid development of Asian economies is due to research, education and laws that assist in building an economy's knowledge capacity. If the research and development (R&D) activities are encouraged (OECD, 2013) to fill the weak and fragmented links found within an innovation system in less successful developing countries (Intarakumnerd, 2006), it is necessary to explore which policies have and will contribute to fill in those gaps. Whilst examining the current national innovation system of Thailand, the major problems within this system are explored.

The aim of the paper is to examine the Thai innovation system, exploring the gaps in the Thai NIS such that it is able to concentrate and formulate a policy to catch up with other developed countries: Japan and NIEs. The first section of this paper includes a general discussion of the national innovation system (NIS) whilst exploring the major contributions in this area. This research paper is not exhaustive and only seminal articles are discussed. The next section will include Thai innovation arena where first the

economic and political situation will be examined followed by the current studies on Thai NIS. Whilst discussing the suggested framework, recommendations and conclusions are provided.

## 2. National Innovation System

A common definition for systems is that they are a body of institutions involved in achieving the same or similar goals. A national innovation system comprises a collective group of institutions that promote:

*acquisition and dissemination of knowledge and are the main sources of innovation ... in a much wider socio-economic system in which political and cultural influences as well as economic policies help to determine the scale, direction and relative success of all innovative activities (Freeman, 2002, p. 194).*

The above definition focuses at the power of knowledge acquired through science and technology in the national innovation systems (Intarakumnerd, 2006; Intarakumnerd, 2012; Kim & Nelson, 2000; Lundvall, 1992; Lundvall, 1998). Lundvall (1992) is the first person who explored and distinguished between the narrow and the broad NIS definitions. The narrow definitions focused on the acquisition and dissemination of knowledge which was channelled through various institutions or research focus societies, and laboratories such as ‘academies of science’ and ‘consulting engineers’. The broader NIS definitions focused on expanding the socio-economic system where those narrower institutions are part of the political, cultural, and economic policies that affect the success of innovative activities undertaken in an economy. For instance, social policies explains ‘a relationship between scientists and entrepreneurs’ (Freeman, 2002, pp. 194-195) and economic policy concentrates on the strong influence by classical economists on industrialisation. As national innovation systems are a broader area for research, where knowledge owned and shared amongst its different actors such as government body institutions, private organisations, universities, financial intermediaries, industry associations play an essential role, it is necessary to first explore the origin and importance of innovation systems.

Freeman (2002, p. 194) describes the evolution of a national innovation system. He states that the national systems began during the fall of the Roman Empire as outlined in the book ‘The Wealth of Nations’ by Smith (1937 reprint of the original 1776 book). He argues that Smith (1937 original 1776) focused on the policies to promote and protect trade which governed the manufacturing sector as evident from the discussion of the period of Renaissance:

*... city-state innovation systems of Renaissance had many remarkable achievements in craft industries as well in financial systems, shipping, the arts, medicine and science ... when the embryonic innovation systems had grown up in the period of the Renaissance developed into something new, associated with the predominance of capitalist industry (Freeman, 2002, p. 194).*

Further Freeman (2002) argues that Smith (1937) recognised the importance of science and technology but its eminence was advocated by List (2001; original text in 1841). List (2001) not only emphasised the importance of infant industries alike Smith (1937), but concentrated on a broader range of

policies. These policies concentrated on the immense role of learning for the creation and application of new technology that assisted in accelerating industrialisation and economic growth.

One may argue that if the importance of both science and technology and knowledge in an economy was recognised such at an early period as being essential components contributing towards economic growth, then there must be some other reasons which prevented some countries from the catch-up with the speed of technological development. Further the importance of knowledge was focused, but its application capability, known as learning capability was understood by List. Colonial powers such as Britain realised the importance of learning opportunities and devised mechanisms to explore and exploit the resources in the underdeveloped Asian countries, which led to further underdevelopment of these nations. From this, it becomes clearer that the understanding of learning(s) was valued highly in the successfully developed countries, and the focus on trade added to the need for the actors to participate in a system which would have been like a national innovation system. The countries that did not realise the need of learning and exploring technical opportunities were mainly Asian, Africa, and the Latin and some European countries. The catch up, although difficult, was successfully undertaken by some countries such as Japan, Taiwan, Korea and Hong Kong. These developments were not immediate, but required understanding one's opportunities, knowledge recognition and development of learning capabilities.

The role of knowledge in an innovation process suggests that it can be classified as an input (Beaver & Prince, 2002) and as well as an output (Huang, Arundel, & Hollanders, 2010; Huang & Rice, 2009). It is arguable that classifying knowledge, as an input or output does not makes a country or a business generate innovative outcomes. It is the application of knowledge that is acquired or assimilated, due to the learning capabilities of an organisation or a country that makes a positive difference in an economy's growth and productivity. Another study by Bell and Pavitt (1995, pp. 71-72) also claims that acquiring foreign machinery (physical embodiment), and having knowledge to operate it does not assist in increasing productivity and efficiency of a country, however the learning capabilities are the main foundation that helps to manage change.

If learning capabilities are important, then it might be of interest to explore who are responsible for generating these capabilities in an economy. An economy comprises government, individuals, private organisations, universities, research institutions that are involved in the process of innovation.

While Schumpeterian theory (Caballero, 2006; Drucker, 1999; Fagerberg, 2009; Klaus, 2010; McGraw, 2009; Rose, 2002) classifies his thinking into 'Schumpeter Mark I' and 'Schumpeter Mark II'. Schumpeter Mark I involved his construction of the role of the entrepreneur as essential for innovation, while Schumpeter Mark II includes his analysis of the role of large corporations as drivers of innovation in an economy. Others such as Penrose (1959) lays emphasis on the role of managers in innovation while von Hippel (1976) studied user innovation in a sector producing scientific instruments and concluded that 80 per cent of these users invented, prototyped and first tested innovations by themselves before the product manufacturer. The role of financial intermediaries (King & Levine, 2004; Patrick, 1966), governments (Braczyk, Cooke, & Heidenreich, 1998; House, 1974; Rothwell & Zegveld, 1982) and research institutions (Freeman, 1995) was also determined to be of substantial importance for economic growth. This neo-classical framework from economics suggests the importance of various actors within an innovation system was beginning to be recognised as of immense importance.

Lundvall (1988) developed an integrated framework of NIS and classified it into two dimensions: the 'national-cultural' and 'etatist-political'. He argues that the interaction between users and producers in a national system is a reflection of culture which prevails in an economy that either supports or inhibits its

economic growth. To support domestic interaction more efficiently, Lundvall (1988) explains the role of government that assists in imposing standards and regulations to support user-producer relationships. Next, the 'factors of production' – labour and capital was addressed; where public agencies and financial institutions play a substantial role in supporting innovative capabilities within and between nations. Due to the process of production, concepts of learning-by-doing and learning-by-using, tacit knowledge started to emerge. These concepts were studied by academics whilst exploring various industries. Lundvall further claims that organisational and institutional patterns can be an obstacle for the efficient utilisation of the new technology.

A new type of innovation: social innovation within NIS was argued by Lundvall (1988) to be of a significant importance. As evident by his argument,

*... social innovations might become more important for the wealth of nations than technical innovations ...institutional change, strengthening the competence and the power of final users, might be one of the social innovations which can give national systems of innovation a stronger position in a world economy (Lundvall, 1988, p. 366).*

In an another study Lundvall (1998, p. 413) summarised the different styles to study NIS. These are a) convergence of production systems and national systems; b) transnational firms to increase the efforts of investment; c) diffusion of innovations and the use of technology and development of professional users, which is similar to his previous study.

While researchers in national innovation systems explained the role of actors in NIS and the industrial upgrade of an economy (Lundvall, 1992; Lundvall, 1988; Lundvall, 1998), none of the studies focused on exploring the causes which restrict the development of these actors in NIS. Lundvall (1988) refers to the institutional and organisational barriers, but fails to be specific about the type of barriers and does not recognise their importance within NIS. I argue that the NIS dimensions detailed by Lundvall (1988) need to be examined from another perspective where rather than studying stakeholders of the NIS, the study concentrates on the main problems which can assist a change in the Thai economy. This can provide a specific perspective for less successfully developed countries to initially focus on their weaknesses such as broader policies and unclear goals which even most of the businesses in the countries fail to understand, as argued by Intarakumnerd (2012) in the case of Thailand.

To study NIS, I use the Thai national innovation system as my case for further exploration. It has been postulated that Thai NIS fails in its implementation of policies (Chaminade, Intarakumnerd, & Sappasert, 2012) and has been unable to catch up with Japan and its other East Asian NIEs. Further due to the unstable political situation of Thailand, the role of NIS becomes of immense importance as a NIS can assist in increasing the productivity and the economic growth in terms of real gross domestic product (GDP) growth. First, I will explore the current economic and political situation of Thailand, followed by an overview of the Thai NIS and its problems, followed by a suggested framework for improving its growth.

### **3. Thailand's Arena**

Thailand's economic growth has seen many difficulties in the past. The impact of Asian financial crisis of 1997/1998, overthrow of the Thaksin government in 2006, the global financial crisis in 2009, the major political disturbances in 2010, floods in the industrial regions of Bangkok and five major provinces

in 2011 is visible through the change in the economic growth from less than 5 per cent, followed by 2.3 per cent and 0.1 per cent respectively in these years (OECD, 2013). The resurgence of the Thai economy was accounted as 7.8 per cent growth in 2010 due to its exports. In 2012 Thailand started to recover with 5.5 per cent gross domestic product (GDP) growth (Central Intelligence Agency, 2013b) when another disruption – political, hit this country in the second half of 2013 and is still continuing in 2014 which further led to a military coup in May, 2014. These different crises at various intervals have affected the allocation of resources, labour productivity, total factor productivity, international trade, technological investment, service productivity, and competitiveness of Thailand's economy. While current political tensions affect not only consumption, foreign investment and government spending but their impact is visible even on its tourism and GDP growth as noted by the (Asian Development Bank, 2014) in the first quarter of 2014, which decelerated to 0.6 per cent.

Following Alesina, Özler, Roubini, and Swagel (1996, pp. 190-191) it is argued that political instability is the propensity for a government collapse where political instability and economic growth jointly determines a lower GDP, reduction in growth and investment, budget deficit, external debts and policy uncertainty; a situation which currently affects Thailand. According to the theory of economic growth, innovation is an outcome of the research efforts within an economy (Szostak, 2009, p. 65). The low inflation and weak economic growth of Thailand due to the political unrest suggests that not only the government policy and its budget will be constrained, but an impact on innovation would also be encountered.

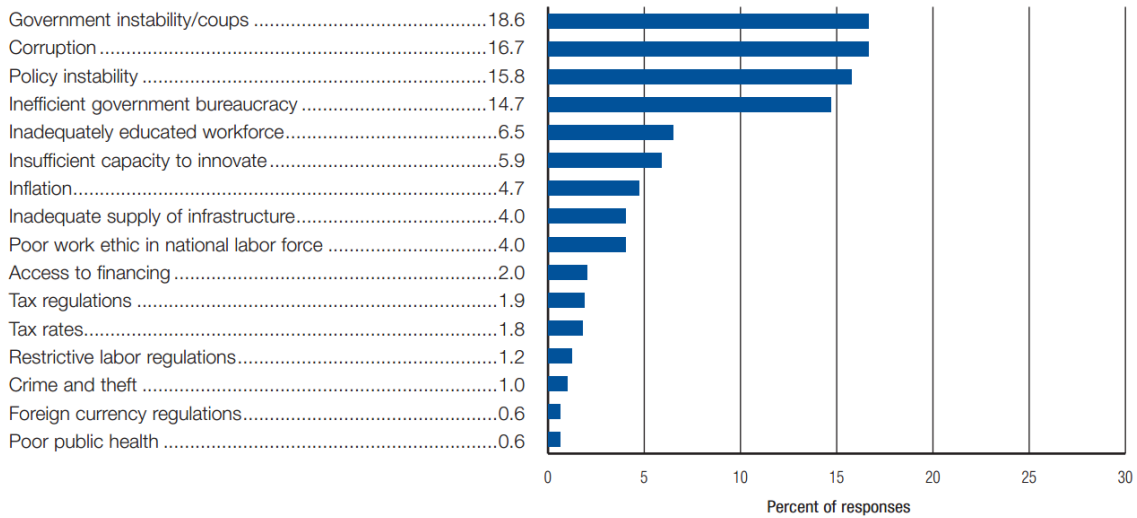
Thus main argument is that as innovation is not a simple process that occurs in isolation, where inputs are combined in a black box to generate innovation outcomes, however is dependent upon the interaction of various factors within an economy. These factors includes economic, social, environmental, political and technological. It is argued that when all these factors are combined and policies are designed to support innovations in an economic system, instability in either the political or economic systems will have a negative impact on all other factors.

### ***3.1 Thai innovation system***

The studies on Thai innovation system suggest that its economy has mostly relied on foreign investment since 1980s and has a great potential for an increase in GDP through global automotive and electronic manufacturing and within the services industry through its tourism (OECD, 2013). Although its government has started to invest in enhancing the capabilities of Thai firms whilst focusing on increasing the competitiveness of the country, there are still many hurdles such as coups, corruption, policy instability, inefficient bureaucracy, educated workforce (Schwab, Sala-i-Martin, & Greenhill, 2012) (see Figure 1) which are barriers to entrepreneurship and innovation in Thailand. If Thailand recognises its capabilities, it will assist its development and catch up with the other innovation focus countries. However there have been many other constraints in its economy resulting in an underdevelopment of the Thai innovation system.

Figure 1: The most problematic factors for doing business in Thailand

The most problematic factors for doing business



Note: From the list of factors above, respondents were asked to select the five most problematic for doing business in their country and to rank them between 1 (most problematic) and 5. The bars in the figure show the responses weighted according to their rankings.

Source: Schwab et al. (2012, p. 344)

There was no direct innovation policy in Thailand until 2002. The national innovation policy came into being when the government of Thaksin Shinawatra came into power. Although it is been argued that the word innovation appeared in several national plans, a substantial science and technology (S&T) policy never existed prior to 2002 (Intarakumnerd, 2012; OECD, 2013).

Within the review of Thai innovation system, some seminal studies are explored. Intarakumnerd (2006), and Intarakumnerd (2012) follow a similar path to Lundvall (1988) in exploring the Thai NIS whilst examining the roles, capabilities and linkages of various actors. While Chaminade et al. (2012) uses a Thai innovation 2002 survey to identify components which affect Thai NIS. These components are a) knowledge resource b) technical support c) openness to innovation d) regulation and other institutional conditions and e) finance and IT infrastructure. The OECD (2013) studied the innovation policy of Thailand by examining the institutional frameworks and policy orientations which were published by the National Science and Technology Development Agency (NSTDA), developed by the World Bank. The structure used by all studies except Chaminade et al. (2012) was focused on exploring the role of actors in NIS. While I agree that studying actors can be effective way of studying NIS in a particular country, exploring the causes which affects Thailand's NIS actors needs a recognition such that appropriate measures are determined to assist better policy making in Thailand. Therefore first the Chaminade et al. (2012) study is discussed as they use an innovation survey and has taken a distinct approach rather than following Lundvall (1988) and others who have studied the Thai innovation systems.

Chaminade et al. (2012) examines the research on Thai innovation systems to identify the systematic problems in their NIS system. For this empirical study, Thai innovation survey 2003 was used to explore systematic problems in the innovation policy. The main weaknesses outlined in their innovation system were a) low technological capabilities (especially in SMEs); b) low research performance of Thai universities; and c) lack of collaborative linkages between users, producers, and universities. They argue that the main reason for these weaknesses was the lack of policy support for research related activities where the rationale of policy development did not match with its implementation (pp.1479). These

arguments were similar to those in other studies by Intarakumnerd (2006); Intarakumnerd (2012); Intarakumnerd and Chaminade (2011).

A two-stage factor analysis was undertaken by Chaminade et al. (2012). First the questions that were helpful to gain the information on ‘the impact of the infrastructure on the innovation process, the S&T capabilities of the firm, the networks of the innovation and the role of institutions in the innovation process’ (pp. 1480) were explored. With the first stage factor analysis they argued that Thailand lacks in adequate qualified human resources within science and technology (S&T) while Thai universities have been involved only in providing consultancy services to various firms to innovate. OECD (2013, p. 274) also made a similar argument. Chaminade et al. (2012) distinguished innovative and non-innovative firms within their research. While commonly both innovative and non-innovative firms shared that the impediment of their growth as the external conditions such as lack of information on a) domestic competition, b) customer’s interest on innovation, and c) markets, but non-innovative firms claim to add another factor which was lack of technological information. In the second factor analysis 4 dummy variables were added and it was concluded that R&D (expenditure per employee) and innovation intensity (measured through innovation expenditure per employee in Baht) was seen as low in institutional, network and support services as compared to S&T. They argued that the main weaknesses were the external conditions including lack of government funding while the driver to growth was high absorptive capacity and collaborative linkages. These two analyses also suggest that mostly Thailand’s policies are limited to the tax incentives for building competencies by training employees and suppliers and there exists ‘no explicit’ innovative policy measures to promote Thai innovation, thus reflecting a narrow vision of Thailand’s innovation system.

The Brooker Group Public Company Limited (2003) facilitated a survey in 2002 for NSTDA and in 2008 Thailand’s science, technology and innovation (STI) policy for the 21st century was introduced. It appears that the policy may have been based on the results of the survey. Chaminade et al. (2012) completed a study in 2009, ostensibly looking at the problems with these policies. However, this study was based on analysing the survey results rather than on the policies themselves. Hence they may not have found the systematic problems which occur in the innovation policies.

The research by Intarakumnerd (2012) on exploring Thaksin’s legacy on Thailand’s NIS is a seminal article. He uses the role of actors as an integrated framework to discuss NIS, but his work specifies various problems that restricted the development of the Thai innovation system (Table 2). Table 2 suggests that most of these problems are related to the lack of technological capabilities and lack of financing. Although political instability as such was not defined in his work directly, he mentions the effects of poor policy management due to the ‘corruption, cronyism and gross violation of human rights’ in Thailand and their effects on its economic and political structure. Intarakumnerd (2006) and Intarakumnerd (2012) arguments are similar to each other; the latter is a more detailed, updated and more cohesive version of the 2006 article.



Table 2: Systematic problems of Thai Innovation system after 2002

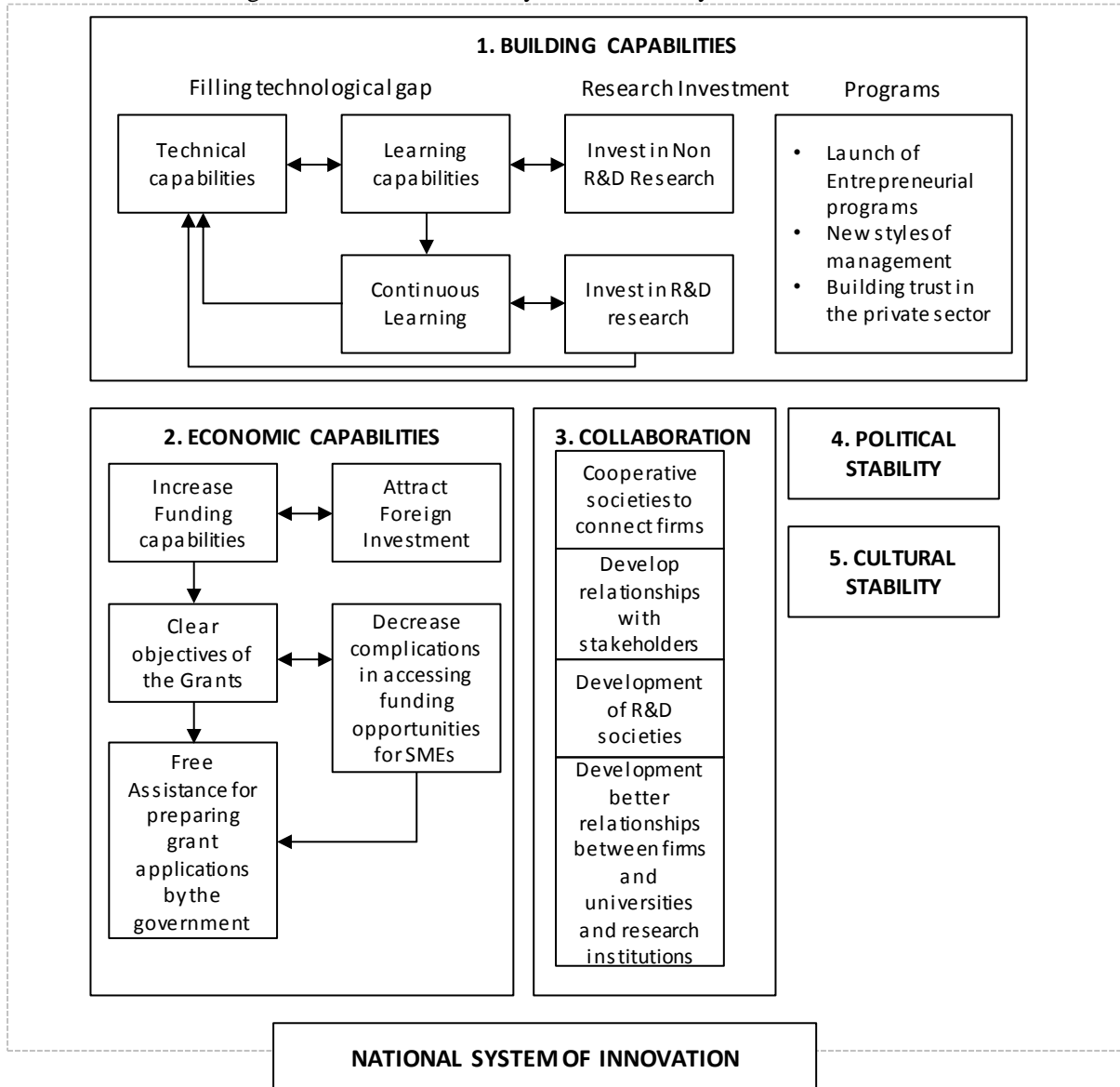
Problems identified	Actors	Type of problem
Weak actors and fragmented systems	All	Technological lag
Failure for inducing “continuous” technological learning	All	Political and economic
Low technological learning capabilities	All	Technological
Unrealistic growth of companies – without deepening the technological capabilities	Private firms	Technological
Deficient design and engineering capabilities	Private firms	Technological
Lack of investment in the product innovation	Private firms	Economic
Lack of collaboration between firms	Private Firms	Economic
Importance of university (or research institutes)-industry linkages were limited to consulting and technical services only	Universities	Lack of Capabilities
Lack of understanding of the importance of non R&D based capabilities	Private Firms	Lack of Capabilities
Lack of strategy	Private Firms	
Private sector organisations such as Federation of Thai industry (FTI) and Thai Chamber of Commerce (TCC) did not focus at increasing innovation capabilities prior to 2002	Private bridging firms	Political
Focus at the short term commercial gains than building long term capabilities	Private bridging firms	Political
Bureaucracy and red-tapism of the financial intermediary firms – application for loans to SME was lengthy and inefficient	Financial intermediaries	Political and Economic
No stock market	Financial intermediaries	Political and Economic
Venture capital investment for start-ups were not encouraged	Financial intermediaries	Political and Economic
Focus on meso- and micro-level foundations for international competitiveness than macro-level	Government	Political and Economic
Broad scope for functional areas of Science and technology policy	Government	Political
Financial pressures to decrease budget deficit	Government	Political and Economic

*Source: Summarised from Intarakumnerd (2012)*

However, in an another study by Intarakumnerd, Wonglimpiyarat, Pinvanichkul, Ngamsirjit, and Thamsatitdej (2012) the interactions among institutions and various public innovation policies were discussed. They argue that the Thai NIS has shifted its focus towards financing the mechanisms for promoting innovations. This is evidenced from the recent schemes of some of the institutions such as the Ministry of S&T, Ministry of Industry, Ministry of Finance and Ministry of Labour. The changes are visible in the overall strategies however, their broader scope makes it difficult to implement all the policies in an effective manner. A shift is occurring within the Thai innovation system with both government and the universities starting to collaborate and work towards achieving the common goal of increasing Thailand’s innovative capabilities.

One of the common issues found in most of the existing literature on Thai NIS is that it is repetitive in nature and new arguments are lacking. Although these well-written papers are informative, they overlap with each other, making it difficult to distinguish the actual arguments in the different papers. This convergence may be due to the small number of academics who have explored Thai NIS so that when they collaborate and discuss their theories, the arguments and most importantly implications are same. Therefore, another perspective is much needed to study Thai NIS framework.

Figure 2: Framework to study Thai national system of innovation



Source: Author herself

#### 4. Final Discussion

As suggested previously a framework that is drawn from the major causes or problems of the Thai innovation system should address all the current major policy weaknesses. Figure 2 presents a suggested framework which, if addressed, would assist Thai innovation being better able to deal with the major challenges. Box 1 Building Capabilities represents a need for building R&D and non R&D based capabilities to assist not only by putting money into technological innovations but also social innovations, as suggested by Lundvall (1988, p. 366). The current and one of the most important challenges that Thai economy faces is its lack of capabilities. In fact, the capability building process that is needed should be a continuous process to catch up the technological lag. It is suggested that it can be better to identify the economy's strengths by recognising the resources – both natural and human support available and then building the policies which promote them most effectively. Tourism is one of the examples, however political instability has affected it in the recent past. Another challenge was that although Thailand did choose four areas to address namely a) R&D (mainly universities and public research institutes), b) human

resource development c) technology transfer from public research institutes to private companies and d) general S&T infrastructure development (Chaminade et al., 2012, p. 1478); but the policies were broad and lacked specificity (Chaminade et al., 2012; Intarakumnerd, 2006; Intarakumnerd, 2012). Thus more clarity in the support policies is required. To provide assistance some programs to support small entrepreneurs could be developed.

As Thai entrepreneurs are low risk takers (Intarakumnerd et al., 2012) which may be due to their existing social values, a cultural change (Box 5) is also required in the way business is conducted, whilst aiming to have economic harmony. The economic capabilities (Box 2) are low at this point, the source of attracting investment and in which sector should be clearly decided within the country. Specific policies to support funding and attract investment is much needed in the Thai economy. However, all these capabilities in Box 1, 2, 3, and 5 are currently being restricted directly or indirectly due to the political instability.

The political instability (Box 4) of Thailand is argued to be a major cause for unrealised innovation system developments. Alesina et al. (1996) studied political instability and its negative effect on economic growth. They provide a comparative example of Argentina and Japan to argue their case. Argentina which was known for its high income per capita (in first top twenty in the world) in 1960s while Japan's per capita income at the same time was lower than countries such as Iraq, Ireland and Argentina (not within first twenty-five countries in the world). A transition in their political economy over the next 30-40 years had a huge impact on not only at the standard of living of the people but also at the economic growth and stabilisation of growth rate. Due to the political instability and several coups d'état and political violence experienced by Argentina it lost its position and its recent GDP growth (2012) was 1.9% (Central Intelligence Agency, 2013a). On the other hand Japan had the same political party from 1960 to 1993 which supported its economy in becoming one of the strongest economies in the world (Alesina et al., 1996). Based on this argument, stability of the political economy and having appropriate leadership, as discussed by Intarakumnerd (2012), can assist Thailand to recover and catch up with other countries.

In summary, better policymaking is required to support the Thai NIS such that its economy develops and stabilises through innovation and invention whilst building its capabilities. Failure to implement the policies is their major challenge. Rather than studying the role of various actors, it is necessary to find the reasons for failures and the area which requires improvement. Further as Thailand has a different culture, work ethic and has political instability, a policy is needed that addresses its major challenges and then explores the best approach to deal with these challenges. While the Lundvall (1988) framework is an integrated way to study NIS, this may not be applicable everywhere especially in the economies which are politically unstable. This new framework requires a close exploration which will be a part of the future studies.

## References

- Alesina, A., Özler, S., Roubini, N., & Swagel, P. (1996). Political instability and economic growth. *Journal of Economic Growth*, 1(2), 189-211.
- Asian Development Bank. (2014) *Asian Development Outlook 2014*. Manila: ADB.
- Beaver, G., & Prince, C. (2002). Innovation, entrepreneurship and competitive advantage in the entrepreneurial venture. *Journal of Small Business and Enterprise Development*, 9(1), 28-37.
- Bell, M., & Pavitt, K. (1995). The development of technological capabilities. *Trade, technology and international competitiveness*, 22, 69-101.
- Braczyk, H.-J., Cooke, P. N., & Heidenreich, M. (1998). *Regional innovation systems: the role of governances in a globalized world*: Psychology Press.
- Brooker Group Public Company Limited. (2003). Thailand's 2nd R&D/Innovation Survey in Manufacturing and Services Sectors and Database Development (N. S. a. T. D. Agency, Trans.) (Vol. May 2003). Thailand: National Science and Technology Development Agency.
- Caballero, R. (2006). The macroeconomics of specificity and restructuring: Cambridge, Mass: The MIT Press.
- Central Intelligence Agency. (2013a). Argentina Economy Profile 2013. *Index Mundi*. Retrieved 20th May, 2014, from [http://www.indexmundi.com/argentina/economy\\_profile.html](http://www.indexmundi.com/argentina/economy_profile.html)
- Central Intelligence Agency. (2013b). Thailand Economy Profile 2013. *The World Factbook*. Retrieved 19th May, 2014, from [http://www.indexmundi.com/thailand/economy\\_profile.html](http://www.indexmundi.com/thailand/economy_profile.html)
- Chaminade, C., Intarakumnerd, P., & Sappasert, K. (2012). Measuring systemic problems in national innovation systems. An application to Thailand. *Research Policy*, 41(8), 1476-1488.
- Dodgson, M. (2009). Asia's national innovation systems: Institutional adaptability and rigidity in the face of global innovation challenges. *Asia Pacific Journal of Management*, 26(3), 589-609.
- Drucker, P. F. (1999). Modern Prophets: Schumpeter or Keynes? *The Frontiers of Management* (pp. 104-115). New York: Penguin Putnam, Inc.
- Fagerberg, J. (2009). A Guide to Schumpeter. In W. Østreg (Ed.), *Confluence. Interdisciplinary Communications 2007/2008* (pp. 20-22). OSLO: Centre for Advanced Study.
- Freeman, C. (1995). The 'National System of Innovation' in historical perspective. *Cambridge Journal of economics*, 19(1), 5-24.
- Freeman, C. (2002). Continental, national and sub-national innovation systems—complementarity and economic growth. *Research Policy*, 31(2), 191-211.
- Great Britain Treasury. (2000). Productivity in the UK: the evidence and the government's approach. London: HM Treasury.
- House, E. R. (1974). The politics of educational innovation.
- Huang, C., Arundel, A., & Hollanders, H. (2010). *How firms innovate: R&D, Non-R&D, and Technology Adoption*. Working Paper. Maastricht Economic and social Research and training centre on Innovation and Technology. United Nations University. Netherlands.
- Huang, F., & Rice, J. (2009). The role of absorptive capacity in facilitating "Open innovation" outcomes: A study of Australian SMEs in the manufacturing sector. *International Journal of Innovation Management*, 13(02), 201-220.
- Intarakumnerd, P. (2006). Thailand's National Innovation System in Transition. In B. Lundvall, P. Intarakumnerd & J. Vang (Eds.), *Asia's Innovation Systems in Transition*. Cheltenham, UK Northampton, USA: Edward Elgar
- Intarakumnerd, P. (2012). Thaksin's legacy: thaksinomics and its impact on Thailand's national innovation system and industrial upgrading. *Institutions and Economies*, 3(1).
- Intarakumnerd, P., & Chaminade, C. (2011). Innovation policies in Thailand: towards a system of innovation approach? *Asia Pacific Business Review*, 17(2), 241-256. doi: 10.1080/13602381.2011.533504
- Intarakumnerd, P., Wonglimpiyarat, J., Pinvanichkul, T., Ngamsirjit, W., & Thamsatitdej, P. (2012). Innovation Financing Schemes of Thailand. In P. Intarakumnerd & J. Wonglimpiyarat (Eds.), *Towards Effective Policies for Innovation Financing in Asia: A Comparative Study of Singapore, Taiwan, Malaysia and Thailand*. Canada: International Development Research Center.
- Kim, L., & Nelson, R. R. (2000). *Technology, learning, and innovation: Experiences of newly industrializing economies*: Cambridge University Press.
- King, R. G., & Levine, R. (2004). *Finance and Growth Schumpeter Might Be Right*: World Bank Publications.
- Klaus, W. (2010). Schumpeterian competition, technological regimes and learning through knowledge spillover. *Journal of Economic Behavior & Organization*, 75(3), 482-493. doi: 10.1016/j.jebo.2010.05.005
- Lall, S., & Teubal, M. (1998). "Market-Stimulating" technology policies in developing countries: a framework with examples from East Asia. *World Development*, 26(8), 1369-1385.
- List, F. (2001). *The National System of Political Economy*. Kitchener, Ontario, CAN: Batoche Books.
- Lundvall, B.-Å. (1992). *National Systems of Innovation: Toward a Theory of innovation and Interactive learning*. London: Pinter.
- Lundvall, B.-Å. (1988). Innovation as an interactive process : user-producer interaction to the national system of innovation : research paper. In G. Dosi, C. Freeman, R. R. Nelson, G. Silverberg & L. Soete (Eds.), *Technical Change and Economic Theory* (pp. 349-369). London: Pinter Publishers.
- Lundvall, B.-Å. (1998). Why study national systems and national styles of innovation? *Technology analysis & strategic management*, 10(4), 403-422.
- Lundvall, B.-Å., Joseph, K., Chaminade, C., & Vang, J. (2009). *Handbook of innovation systems and developing countries: building domestic capabilities in a global setting*: Edward Elgar Publishing.

- McGraw, T. K. (2009). *Prophet of Innovation: Joseph Schumpeter and Creative Destruction*. United States of America: Harvard University Press.
- OECD. (2013). Thailand: innovation profile *Innovation in Southeast Asia*. Paris: OECD.
- Patrick, H. T. (1966). Financial development and economic growth in underdeveloped countries. *Economic development and Cultural change*, 174-189.
- Penrose, E. T. (1959). *The theory of the growth of the firm*. New York: Wiley Publishers.
- Rose, F. (2002). The Father of Creative Destruction : Why Joseph Schumpeter is suddenly all the rage in Washington. *Wired*.
- Rothwell, R., & Zegveld, W. (1982). Innovation and the small and medium sized firm. *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship*.
- Schwab, K., Sala-i-Martin, X., & Greenhill, R. (2012). The global competitiveness report 2011-2012: Citeseer.
- Smith, A. (1937). *The wealth of nations [1776]*: na.
- Szostak, R. (2009). *The causes of economic growth*: Springer.
- United Nations Development Programme (UNDP). (2009). Human Development Report. New York: UNDP.
- Von Hippel, E. (1976). The dominant role of users in the scientific instrument innovation process. *Research Policy*, 5(3), 212-239.