

## **What can late adopters learn from the formulation and forming of successful national ICT4D strategies- An institutional process model on ICT innovation**

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### **Abstract**

Using case study research (Yin 1984) we build a process model grounded in institutional theory and the King, Gurbaxani, Kraemer, McFarlan, Raman, Yap (1994) framework on the forming (Mintzberg, 1978) of national ICT strategies development and economic growth. The model is developed through a process of analyzing and synthesizing multiple cases of exemplar states that differ with respect to geographic region, economic and population size, and the nature of government. We use multiple sources of data, including the extensive ICT4D literature on the individual cases, to pattern the strategy forming processes for each case to the institutional factors of the King et al framework and then synthesize our findings to formulate a contextually sensitive process model premised on identifying institutional actors, and their capacity to act (their interventions). The King et al framework offers a powerful, contextual framework for patterning regulatory and influential behavior from both supply and demand directed action. However, preliminarily it appears that with the development context the framework needs to be supplemented. The contribution of our study is in multi-geographic patterned understanding on national ICT4D strategy forming which has implications for lagging nations on the ICT Opportunity Index.

*[This is a work-in-progress]*

## **1. Introduction**

Though development is a complex and wicked problem, the contribution to economic growth and development from information and communications technologies (ICT) is an assumption that much of ICT4D research holds to be true (Ngwenyama, Andoh-Baidoo, Bollou and Morawczynski 2006); Avgerou, 2008; Gao and Rafiq, 2009; Imran and Gregor, 2010(Silva and Figueroa 2002); Walsham and Sahay, 2006). On the other hand, the criticisms of ICT as an enabler of economic development reflect the reality that policy makers and other stakeholders in developing countries face competing priorities in the face of especially limited resources. Development critics argue that investments in agriculture, health, and education are directly related to the primary need to reduce extreme poverty, fight endemic diseases and illiteracy, and should be prioritised over national and international efforts to bridge the digital divide (Wade 2004; Avgerou 2008). Yet, protagonists of ICT hold that ICT offers an unparalleled opportunity to meet essential development goals (Chacko 2005) thus allowing developing nations to “leapfrog” traditional development problems like poverty, illiteracy, disease, unemployment, hunger corruption, and social inequalities (Keniston 2002; Sundén and Wicander 2003).

In the last two decades we have seen evidence of developing countries and states prioritising ICT initiatives and investments with encouraging outcomes; for instance, several recent studies have examined the broadband initiative in South Korea (Choudrie, Papazafeiropoulou and Lee 2003; Lee 2003; Choudrie and Lee 2004; Lee and Chan-Olmsted 2004), others have looked at ICT initiatives in Singapore (Choo 1995; Yap and Thong 1997; Yap and Thong 1997; Lim 2005; Li, Tan, Teo and Tan 2006), India (Keniston 2002; Kaushik and Singh

2004; Kshetri and Dholakia 2009), Bangladesh (Imran and Gregor 2010), Chile (Silva and Figueroa 2002), Guatemala (Montealegre 1998; Silva 2007), South Africa (Brown, Cajee, Davies and Stroebel 2003), Latin America (Ngwenyama and Morawczynski 2009), West Africa (Ngwenyama, Andoh-Baidoo et al. 2006; Bollou and Ngwenyama 2008). In accord with Avgerou (2008), we reflect that while some studies problematize failure (Imran and Gregor 2010), others consider outsourcing relations (Silva 2007), others the diffusion and adoption of a specific technology such as mobile telephony (Brown, Cajee et al. 2003), and when considering the strategic potential of ICTs for macro-societal transformation, Avgerou surmises that there are two areas of related literature “the first is concerned with ICT as a strategic resource for the growth of the economy” (Avgerou 2008, p.138)—studies that examine the impact of IT investments on macro-level measures are of this nature (Ngwenyama, Andoh-Baidoo et al. 2006; Bollou and Ngwenyama 2008; Ngwenyama and Morawczynski 2009). The second is concerned with “the way ICT may contribute to the improvement of social services and institutions, such as health services and state governance”(Avgerou 2008, p.138). Some studies have examined the impact of general or directed government ICT policies on commercial enterprise: (Lim 2005) looks at the effect of ICT policies in Singapore on small and medium enterprise: (Kim 2006) on the adoption of B2B adoption in the Korean fishery wholesale industry; Okoli, Mbarika, and McCoy (2010) examine the effect of directed government policies on e-business capabilities in both Latin America and Sub-Saharan Africa.

An important feature of many of such studies is the contextual in-depth examination of an ICT initiative, or adoption strategy in a particular country or region. Such build an important knowledge base for formulating understandings of the empirical value of ICT within contextually located imperatives.

Theoretically, neo-institutional theory along with other contextually grounded social theory such as Actor Network Theory (ANT) and structuration theory have provided “insights and vocabularies” (Avgerou 2008) to understand conceptual relationships in ICT4D research. The theoretical framework by King, Gurbaxani, Kraemer, McFarlan, Raman and Yap (1994) (1994) which is grounded in institutionalism has influenced and/or been employed by ICT4D researchers (Silva and Figueroa 2002; Choudrie and Lee 2004; Shin 2007) as a model for analysing policy interventions directed at IT innovation and diffusion (King, Gurbaxani et al. 1994) is grounded on the analysis of the role of institutions in the IT diffusion process as a more efficient analysis.

Yet many developing countries still lag behind; quantitative data from the ITU’s ICT Opportunity Index (WISR 2007) shows many developing countries still lie on the bottom end of the index which measures “access to and use of ICT for the large majority of the world’s economies” (WISR 2007, p.119).

Using case study research (Yin 1984) in this study, we propose to build a process model on national ICT strategy forming (Mintzberg 1978) that is grounded in institutional theory and the institutional framework of King, Gurbaxani et al (1994). The model is developed through a process of analyzing and thereafter synthesizing multiple cases of exemplar states that differ with respect to geographic region, economic and population size, and the nature of government. We use multiple sources of data, including the extensive ICT4D literature on the individual cases, to pattern the strategy forming process for each case to the institutional factors framework of King et al., and then synthesize our findings to formulate a contextually sensitive process model premised on identifying institutional actors, and their capacity to act

(their interventions). The King et al framework offers a powerful, contextual framework for patterning regulatory and influential behavior from both supply and demand directed action. The primary aim of our study is to formulate a conceptual understanding of the strategy formulation and forming process for national ICT4d within these diverse environments. The underlying assumption being that the King, Gurbaxani et al framework was an adequate (and contextually sensitive) mechanism for understanding what transpired as these five exemplar states as they engaged in ICT strategies for economic growth and development. However, in the preliminary collection and analysis the data from the different case studies, it becomes clear that the patterns emerging suggest the King, Gurbaxani et al framework is not sufficient without some modification as an explanatory conceptual device. Thus the second aim of the study is to locate the King, Gurbaxani et al framework within the emerging patterning of the evidentiary data. The result is a process model based on the institutional framework, the theoretical contribution of our study. Process theories focus on sequences of activities to explain how and why particular outcomes evolve over time (Mohr 1982; Montealegre 2002). In so doing, recommendations relevant to lagging nations' policymakers and leaders could be made about the forming and formulation of national ICT strategies for development from an institutional and processual perspective.

Taken from exemplar case studies of states that have been (relatively) successful in their "country profile" in the adoption ICT4D adoption, the following are research questions?

1. For each case ,which or what kind of institutions played a role in the promotion and adoption of national ICT4D strategies (from the very early conceptualization, planning to implementation stages)

2. Which influence, regulatory, supply/demand actions did they promote or embark on, how, and when (at what stage)? Who did they influence/persuade or regulate and how? And what were the resulting outcomes

The rest of this paper is organized as follows: section 2 summarizes the research method followed by a summary of data collection methods in section 3. Section 4 discusses the King et al framework (1994). Section 5 presents a summary description of (some) of the cases, and Section 6 shows an example of the initial pattern matching of case evidence to the King et al. framework. Section 6 would be the discussion section (which is limited at this stage), and Section 7 would present the Process Model.

## **2. Research Method**

This study uses case study research method with multiple case studies (Yin 1984; Eisenhardt 1989). Cases are selected to represent a variety of geographic regions, relative size (economy and population, and type of government.

## **3. Data Collection**

Multiple sources of data will be collected: Data from the ICT4D literature related to each particular state, other sources such as the international development organizations, and sources such as the media. In some cases, interviews with persons from relevant institutions will be conducted.

## **4. The King et al Framework**

King, Gurbaxani, et al. (1994) conceived a model for understanding IT innovation and diffusion from the perspective institutionally driven action; the model grounded in

institutional theory. Though originally conceived with the developed world in mind, ICT4D researchers have used the model and/or ground their understandings within the logic of the model. (Azad, Faraj, Goh and Feghali 2010 {Silva, 2002 #132; Imran and Gregor 2010; Okoli, Mbarika et al. 2010}). Silva and Figueroa employed this model to characterize their empirical understanding of institutional interventions related to IT innovation and ICT4D in Chile; their study primarily focuses on the interventions of government institutions, and to a lesser extent foreign aid institutions such as the World Bank.

In this study, we draw on the King et al (King, Gurbaxani et al. 1994) model, to explain ICT4D and innovation grounded in economic history and institutional theory for understanding the dynamics of change and the role of institutions in IT innovation. The King, Gurbaxani, et al. (1994) model conceives institutional interventions directed at IT innovation as “the intersection of the influence and regulatory powers of the institutions and the ideologies of supply-push and demand-pull models of innovation” [p.139]. The formation of policy with respect to IT innovation is “facilitated by an understanding” of the multidimensional “role of institutions in the innovative process, and on the contingencies governing any given institution/innovation mix” (King, Gurbaxani et al. 1994, p. 139). The institutional theory view supposes the existence of various types of social institutions with some capacity for *influence* over and/or *regulation* of ICT innovation; both influence and regulation can be *supply-push* or *demand-pull* (King, Gurbaxani et al. 1994) where: supply-push interventions are directed at stimulating the production and application factors that go into innovating, for example: a growing supply of scientific and technical knowledge, the provision of capital for experimentation and development of prototypes, support for getting innovative products and processes ready for the marketplace. Demand-pull

interventions are directed at defining and articulating demand for envisaged innovative supply sources while simultaneously mobilizing user/consumer acquisition of envisaged innovations.

Specifically, institutional action is categorized into the following types of action: knowledge building, knowledge deployment, subsidy, standard setting, innovation directive, and mobilization. though important to our study, it is not our intention to re-describe these in full, a brief description of each one of these can be found in Appendix A; interested readers will follow the reference. Table 1 shows a summary of model factors where: (exemplar) institutional interventions categorized as supply-push or demand-pull regulatory, or influence-based interventions. The institutional model proposed by (King, Gurbaxani et al. 1994) hypothesizes social institutions engaged through influential and/or regulatory action in supply-push and/or demand-pull interventions as drivers of (ICT) innovation.

	Supply Push	Demand Pull
<b>Influence</b>	<b>Knowledge Building</b> -Funding research programs	<b>Knowledge Deployment</b> -Training programs for individuals and organizations to provide base for skilled talent for use  <b>Subsidy</b> -Procurement of innovative products and services -Direct or indirect provision of complementarities for use -Direct or indirect suppression of substitute products or services  <b>Mobilization</b> -Programs for awareness and promotion
	<b>Knowledge Deployment</b> -Provision of education services	
	<b>Subsidy</b> -Funding development of prototypes -Encouragement of capital markets to support R&D provision of tax benefits	
	<b>Innovation Directive</b> -Direct institutional operation of production facilities	

<b>Regulation</b>	<p><b>Knowledge Deployment</b></p> <ul style="list-style-type: none"> <li>-Require education and training of all citizens</li> </ul>	<p><b>Subsidy</b></p> <ul style="list-style-type: none"> <li>-Procurement support for products and processes that facilitate adoption and use</li> </ul>
	<p><b>Subsidy</b></p> <ul style="list-style-type: none"> <li>-Reduction in general liabilities for organizations engaging in innovative activity</li> <li>-Modification of legal, administrative or competitive barriers to innovation</li> </ul>	<p><b>Standard Setting</b></p> <ul style="list-style-type: none"> <li>-Require particular products or processes to be used in any work for the institution</li> <li>-Require conformance with other standards that essentially mandate use of products or process</li> </ul>
	<p><b>Standard Setting</b></p> <ul style="list-style-type: none"> <li>-Establishment of standards under which innovative activity might be encouraged</li> </ul>	<p><b>Innovation Directive</b></p> <ul style="list-style-type: none"> <li>-Require that specific innovation products or processes be used at all times</li> </ul>
	<p><b>Innovation Directive</b></p> <ul style="list-style-type: none"> <li>-Establishment of requirement for investment in R&amp;D by organizations</li> </ul>	

Figure 1: The King et al: Innovation Model Factors

## Case Studies

In this section we give brief descriptions of the case studies. We remind the reader that the intention is to study the case from the nascent phases of the strategic forming or formulation process ICT for economic growth and development plans. The cases we consider are from across several regions in the world: Jamaica, Singapore, Chile, South Korea, Mozambique, South Africa and the State of Virginia<sup>1</sup>. First, we will give a brief narrative of important developmental steps for each country. For each case, we will then pattern-match the initiatives taken by institutional actors using the King et al (1994) framework factors. We will also have to pattern initiatives that are part of the framework. Once each case is analysed, we will synthesize and draw conclusions for the case study

[Below we show only portions of the work in development]

<sup>1</sup> Note: because the study is a work in progress for the purpose of the workshop, not all case studies are described in this paper.

### *Jamaica/Barbados/Trinidad and Tobago*

In 1996 the National Industrial Policy was announced by the Jamaican government as a blueprint for economic development. The NIP was 15 year vision that covered the areas of macroeconomic policy, industrial strategy, social policy and environmental policy (Thompson and Brown 2007). In the year 2000, the government presented a five year strategic plan for information technology envisioning that by 2002 the IT sector would be a major source of job creation in Jamaica. The National strategic plan for IT covered the following: Infrastructure and access, e-business, e-government, and economic development

### *Chile*

### *Mozambique/South Africa*

### *Singapore:*

Singapore<sup>i</sup> is a parliamentary republic in southeast Asia with a current population of about 4.7 million people. At the start of the 1980s, Singapore articulated a vision to become an “Intelligent Island” (Choo 1995) Singapore created a three-phase plan spanning the following [1981-1985],[1986-1990], and [1991-2005]. In the first phase [1981-1985] Singapore started an intensive computerization program directed at the civil service. They established a National Computer Board whose objective and mandate was to computerize government ministries, raise productivity and increase the quality of public services. In this first phase Singapore exploited the following technologies: transaction processing, data modelling, and database management systems. In the Second phase [1986-1990] Singapore developed a National Information Technology Plan whose two main goals were developing a strong

export-oriented IT industry, and improving business productivity through the application of IT. Research Centres were established that developed advanced technologies and applications for both industry and state-owned enterprises. However this was a marked shift in directed effort from the public to private sector exploiting: software engineering, expert systems, EDI. The third phase [1991-2005]: Singapore developed the IT2000 Master Plan whose vision was to transform Singapore into an Intelligent Island “where IT permeates every aspect of society”(Choo 1995). The goal was to increase the quality of life and boost national competitiveness and the economy. The technologies exploited were broadband, and e-government. The effect of the plan developed Singapore as a global hub by shifting (the supply of global) knowledge intensive work to Singapore; gains in the quality of life goal freed up personal time, made telecommuting viable, and for example computerized traffic control eased congestion and associated costs. Though not discussed here, Singapore continues to think, plan and act with a national strategic plan at the core.

### ***South Korea***

South Korea is a republic in Southeast Asia with a current population of approximately 47.8 million. Following the 1997 economic crash, South Korea emerged relatively quickly as a leader in broadband penetration. Following the 1997 crash Korean leadership identified IT as an important stimulus to the recovery. In 1999, the government proclaimed *Cyber Korea 21*(Choudrie and Lee 2004), a readily communicable device for articulating South Korea’s vision to become a knowledge-based society. The vision had two twin goals: improving quality of life and increasing the competitiveness of the country (Choudrie and Lee 2004; Kim 2006). The actualization of this vision details a series of initiatives that dovetailed supply-push and demand-pull strategies to becoming a knowledge-based economy. From providing PC to schools, targeting homemakers with Computer and Internet literacy training,

to giving subsidies to private firms that delivered IT and Internet training programmes to the targeted homemakers, Korea strategically went about promoting and creating the capacity to become an efficiency-focused knowledge economy. The details of the specific initiatives undertaken in Korea are included in our detail analysis in the next section; however it also important to note other systemic, structural factors that contributed to South Korea's success such as Korea's high density housing, and an education focused culture (Choudrie and Lee 2004).

### *Virginia (A US State)*

Virginia is a state in the United States. Choosing to include study a state within the United States may seem curious; however there are compelling reasons to do. It could be argued that from a development strategy and policy perspective, it more instructive to study individual states in the USA than the federal government, in fact, as we will see, innovation at state level can predate that at federal government. Why Virginia was selected? During the two governorship terms of Jim Gilmore (1998-2002) and Mark Warner (2002-2006), Virginia embarked on a concerted strategic plan for ICT and economic growth and the outcomes as measured against other states were marked. Rich sources of documentation and insight from individuals involved in the successful transformation that Virginia went through impart useful descriptions of the strategic forming (Mintzberg 1978) process.

## **Pattern Matching**

In this section, show a sample of some of the patterning of the story behind each case and map it to the framework. With data evidence from the cases we have found that coding to the framework yielded some fine-tuning and as such what is shown here is an incorporation of those extensions so far. Institutional **actions** are at the core of the framework, these are categorized as: *knowledge building, knowledge deployment, subsidy, standards, innovation*

*directive, and mobilization.* Each defined action category can be thought of as a broad potential goal that can be delineated into multiple objectives that are measurable, and pursuable by diverse social stakeholders. Thus for each action type (or goal) such as knowledge deployment we can specify measurable objectives such *private* or *public* deployments. In turn, for each objective, we can identify specific and time-bounded *initiatives* (tasks and actions) for achieving an objective. Collectively, the set of initiatives related to an objective and set of objectives related to a goal can be used to assess the relative capacity of a country to act with respect to. that goal.

An important challenge facing governments in developing countries is a deficit in the knowledge and capability to guide, direct or manage the development of capacity of ICT4D(Unwin 2009). Related to this knowledge deficit is the ability or knowledge to develop accountability mechanisms. In developed economies there is likely already to be a battery of institutionalized accountability mechanisms and institutions; for example the government accounting office (GAO) in the USA, and various other reporting requirements from state agencies. In a developing country, on the other hand, and in particular with respect to ICT4D such mechanisms may and often do not exist, and the knowledge needed to identify how initiatives can be tracked and measured for success or failure are weak. Our data suggests incorporating *measures of performance* for proposed initiatives. Thus for each type of institutional action or goal, we identify (a set of) objectives and initiatives and their related measures of performance (see Figure 2 below).

<b>Goal</b>	<b>Objectives</b>	<b>Initiatives</b>	<b>Measures of performance</b>
<b>(Institutional Action)</b>			

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<b>Knowledge Building</b>			
<b>Knowledge Deployment</b>			
<b>Subsidy</b>			
<b>Standard Setting</b>			
<b>Innovation Directive</b>			

Figure 2. Strategic Framework for ICT4D Template

Thus merely from the discussion of the framework found in King et al, a sample mapping of this nature is shown below:

**Table 1: Conceptual, country non-specific coding (sample)**

<b>Institutional Action/Goal</b>	<b>Objectives</b>	<b>Initiatives</b>	<b>Measures of performance</b>
<b>Knowledge Building</b>	Human capital	->Private education  ->Public education	
	Via organizations		
<b>Knowledge Deployment</b>	Encourage knowledgeable people, organizations to contribute/engage with local human capacity	Immigration policy and laws	
<b>Subsidy</b>	Encourage private investments	-Preferential treatment on loan guarantees  -Provision of tax breaks	
<b>Innovation Directive</b>	Support for provisioning, establishment and maintenance of reliable and continuous	-Subsidize* <sup>2</sup> electrical, and telecommunication services	

<sup>2</sup>\*In some cases, there is an overlap in the categorization of initiatives; they do not always strictly belong one class of intervention (and this will be interesting as we pattern multiple cases in detail)

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	infrastructure services		
	Reduce barriers to production innovation by individuals and organizations	-Limit legal restrictions on maximum liabilities	
	Reduce barriers to competition in the use of an innovation	Revise Patent and copyright laws	
<b>Standard Setting</b>			

**Table 2: South Korea: preliminary coding**

Goal	Objectives	Initiatives	Measures of performance
<b>Mobilization</b>	-Deregulation and competition policies	-Hands off policy towards nascent Broadband Industry  (Choudrie, Papazafeiropoulou et al. 2003; Lee 2003; Choudrie and Lee 2004; Lee and Chan-Olmsted 2004)[1]	-Intense competition between facilities based service providers: KT and Hanaro  Prices
<b>Subsidy (supply)</b>	-Provide loans at preferential rates to facilities service providers (initial) for infrastructure building  -Provide loans at preferential rates to facilities service providers (for rural areas)		-Spending/Negative Taxation  1999-2005:  \$926m spent

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<b>Subsidy (demand)</b>	-Prepayment for public services to be paid back by FSPs as deferred service charges		
<b>Knowledge deployment/ Mobilization* (demand)</b>	-IT Literacy and internet literacy programmes for elderly, military personnel, farmers, low-income families and prisoners	“ Ten million people Internet Education”  => internet education for 10 million people including 1million homemakers	
<b>Subsidy (demand)</b>	-IT Literacy and internet literacy programmes  Internet access /infrastructure to primary and secondary	-Subsidies to private IT/internet training institutes for training homemakers  Government discounts offered to private provider for provision of internet in primary and second schools	

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Innovation directive (demand)	Creation of downstream products/services	Creation of broadband content:  Online gaming  Video-on-gaming  PC Bangs <sup>3</sup>	
Vision?  “Cyber Korea 21”  “ A Knowledge based society”	Government vision:  Competitive high speed internet market	Strong, consistent message to all stakeholders: plus initiating investment (supply) and promotions with the population (demand)	

Measures of performance are an important part of the process and a documentation of the types of metrics used will be important. For each case, we anticipate we will identify there will be different types of metrics, from different sources, how often they are used, whether the baseline and target values were set and at what level.

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<sup>3</sup> PC Bangs are PC Rooms conceptually similar Internet Cafes. They are places where the public can go to take advantage of the high performance PCs and high capacity bandwidth on offer for a price PC Bangs caught on rapidly and quickly became a part of the pop culture landscape.

Additionally, a prominent action taken by government: defining a vision of what and who the country seek to be is an integral and crucial part of the process.

<b>Vision</b>	<b>Stakeholders</b>	<b>What</b>	<b>Country</b>
Asks the question: What and who do we want to be?			
“Intelligent Island”			Singapore
<ul style="list-style-type: none"> <li>● “Cyber Korea 21” in 1999</li> <li>● “Knowledge-based society”</li> </ul>	Government; Access providers; Equipment vendors; Content providers PC Bangs (industry) => demand pull	Broadband initiative	S. Korea

## Discussion

The King et al framework is a comprehensive and powerful conceptualization for understanding ICT innovation and development, though not inappropriate for the developing world, the constraints and context found in developing countries pose a particular challenge for a factor based framework. Specifically, important considerations are not explicitly in the purview of the model, or are assumed to a priori hold within the context of the conceptualization and therefore not addressed. For example, the prioritization possible institutional actions, consensus building: the need to deliberately and carefully build consensus among potential stakeholders appears crucial because influential and regulatory institutions are not necessarily consensually aligned in the pursuit of ICT innovation and its goodness. The framework presupposes systems of measure, i.e. measures of performance exist; for example, that *directives, subsidies* and *standards* can be reliably or systemically measured. This is not necessarily the case in the developing world. Last but not least, the framework presupposes the existence of systems/channels (or a culture?) of relatively transparent and reliable communication. Communication affects every aspect of the model, it is however critical with reference to performance measures. The ability to communicate targets and related performance metrics to all stakeholders is crucial for progress and for the accountability of actors and stakeholders. In a developed, economy, all of these may be reasonable assumptions, however for developing economies newly engaging with various ICT for the purposes of national development or innovation goals we propose that the above omissions are important and even critical for theoretical and practical understandings

This has implications for both theory and practice.

## **From Factors to a Process Model of Institutional Action**

We will develop a process model that might for example start with define a vision that describes who you want to be, and communicate the vision persistently. On the other hand, the first stage could be consensus building

### **Stage 1**

Define Vision

(Who do we want to be?)

Communicate Vision

### **Stage 2**

Communicate Vision

### **Stage 3**

Communicate Vision

## **8. Conclusion**

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## APPENDIX A: SUMMARY DESCRIPTION OF INSTITUTIONAL INTERVENTIONS

**Knowledge Building** is undertaken to provide a base of the scientific and technical knowledge required to produce and exploit innovations, examples include sponsored research.

**Knowledge Deployment** is undertaken to stimulate the dissemination of knowledge in the form of knowledgeable persons, organizations or repositories of knowledge as in archives and libraries. Other examples include the provision of knowledge (public or private) to the population ; bringing back or encouraging knowledgeable expatriates to return

**Subsidy** is the use of an institution's (usually government or state) resources to defray the unavoidable costs or risks incurred by innovators or users in the process of innovation

**Standard** setting is a form of regulation aimed at constraining the options of decentralized actors and organizations in line with larger social or institutional objectives. Standards are socially constructed; they are agreements or "treaties" among interested parties to describe one way of doing things as "preferable."

**Mobilization** is the encouragement of decentralized actors and organizations to think in a particular way with respect to an innovation. By encouraging a positive or negative view of an innovation, diffusion of IT will be affected. Mobilization is a subtle force, and can be found in all of the above.

An **Innovation Directive** is a command to produce innovations, to use them, or to engage in some activity that will specifically facilitate their production and/or use. An institution can produce its own innovations and use them, or give a directive commanding organizations to invest certain amounts innovation R&D

Figure A1: A Summary of Institutional Interventions as defined in the King et al. (King, Gurbaxani et al. 1994) model.

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<sup>i</sup> The four so-called Asian Tigers are now considered developed countries by the IMF (Singapore, South Korea, Hong Kong, Taiwan), the UN still classifies them as developing nations UNDATA (2011). Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings, UNSTATS..