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### City Innovation Systems: The Next Horizon in Innovation Studies for Southeast Asia

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*The Global Network for Economics  
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# **City Innovation Systems: The Next Horizon in Innovation Studies for Southeast Asia**

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## **Abstract**

Innovative activities take place primarily at the city level. But the levels of analyses in the existing innovation-system literature, as well as the target of policy instruments in many developing countries in Asia, are usually limited to the national and sectoral levels. This paper proposes a new conceptual framework that may be used to elucidate the reasons and drivers of innovation and innovative capacity within complex urban environments in developing economies. We first discuss the existing concepts of innovation systems, the analytical frameworks and methodologies, and the conceptual and practical limitations. We then explain the two propositions that shape our framework. First, innovation activities require interactions among actors and activities at the three spatial dimensions: physical space, information space, and cognitive space. Cities thus provide an ideal environment for innovation, offering proximity, density and variety in the three spaces. Second, in order to capture the essence of city innovations in developing economies, we argue that the analytical scope should be broadened to include innovative activities and outputs that are not only for-profit innovations by firms but also not-for-profit innovations that aim to solve urban problems.

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## 1. Introduction

Twenty years after Christopher Freeman's book on Japan's national innovation system, the concept of innovation system today has spawned a considerable volume of scholarly literature and influenced innovation policy makers around the world. While European researchers such as Freeman and Bengt-Åke Lundvall are credited with starting this intellectual tour de force, the idea caught on, and Asia soon followed suit. A growing body of literature on Asian innovation systems is now emerging, including work referring specifically to the Southeast Asian countries. Several conferences, notably the annual "Asian Network for Learning, Innovation, and Competence Building Systems" (ASIALICS), have helped to focus the attention of researchers and policy-makers on this theme. The concept's academic recognition is now firmly established. Moreover, its influence in Asian countries is increasingly apparent in the policy arena, where policy frameworks are evolving rapidly in an attempt to embrace systemic and structural approaches to promoting innovation.

However, as is the case with any academic and policy idea, there is always room for improvement for the concept of innovation system and its implementation. We find that much of the current literature on innovation systems in Asia pays little attention to the physical and geographical dimension of innovative activities. Among the studies that do, the attention is on usually the effects of agglomeration economies and related issues such as learning and interactions among actors. Still their focus is more on localization economies than urbanization economies, even though the latter is no less important in promoting knowledge sharing among innovative actors. This omission is surprising, considering most innovative activities occur in urban areas.

In this paper, we argue that the current concept of innovation system, as academically inquired and professionally practiced in a few Southeast Asian countries, is still too limited to be useful and to affect developmental outcomes in these countries. We propose that the concept of innovation systems both for academic inquiry and policy formulation should be adjusted in two ways. First, the level of analysis should be brought down from the national and sectoral levels to the city level. Second, the scope of definition should be broadened to include innovative activities and outputs that are not only for-profit business and industrial innovations by firms but also not-for-profit innovations that aim to solve urban problems that affect people's quality of life.

The paper is organized as follows. In sections 2 and 3, we discuss the limitation of current literature and policies on innovation systems as applied to emerging and developing economies in Southeast Asia. Section 4 details our first proposition that the city is the appropriate scale at which innovation systems should be analyzed in Asian developing countries. Then, we discuss the similarities and differences between the concept of city innovation system and that of regional innovation system and elaborate on our second proposition that any research on city innovation systems in emerging and developing economies need to broaden the definition of city innovations. In the last section, we outline the possible methodology for conducting research on city innovation systems in a megacity in Asia.

## **2. Limitation of current concepts of innovation systems**

The concept of national innovation system (NIS) has become widely known through Freeman's seminal book on Japan (Freeman 1987) and through the work of Freeman and Lundvall (Freeman and Lundvall 1988). Since then a large volume of studies have examined a variety of topics related to NIS. There are now several definitions of NIS but the term generally refers to a set of institutions that determine the flow of information and knowledge among innovators, enterprises and institutions, which are fundamental to developing and diffusing new technologies and innovations. Such institutional relationships affect innovative performance at the national and sectoral levels.

More recently, standard references on the transitions of Asian innovation systems in national and sectoral levels include two books, one edited by Richard Nelson on leading latecomer economies such as Chinese Taipei and South Korea (Nelson 1993), and the other by Lundvall *et al* on a group of new Asian latecomers, including China, Hong Kong, India, Indonesia, Singapore, and Thailand (Lundvall, Intarakumnerd and Vang 2006). Other studies on Asian innovation systems offer comparative pictures on innovation systems in Southeast Asia, as the region develops into a key strategic production and service hub for all of Asia. Examples include Chairatana and Bach (2003) on Thailand and Vietnam and on manufacturing innovation activities in Malaysia, and Thailand; Mani (2004) on financing innovation in Malaysia and Singapore; and Berger and Diez (2006) on regional and sectoral innovation systems in Malaysia, Singapore, and Thailand.

Although such progress is indeed impressive, there are still considerable information gaps that call for further research. First, the European innovation system model is based on its own unique socio-economic, institutional and cultural environment. By adopting such a model in framing national innovation policies in Southeast Asia's vastly different political, institutional and cultural contexts, policy-makers may have discounted the significance of such factors as determinants of success.

Second, the levels of analysis in the literature, as well as the target of policy instruments, are generally the national and sectoral levels. Thus, the innovative capacities and competitiveness of nations tend to be compared using aggregate national-level data, which can mask wide disparities in development and access to innovation support structures and services between urban and rural areas within each country. The foci of the innovation-system policies are usually limited to sectors and innovations that are expected to increase national and industrial competitiveness. Very little attention is given to innovative solutions that aim to solve actual problems that people, particularly the poor, face on a day-to-day basis. For that matter, people have never been at the center of the innovation-system literature and policy.

The current concepts and practices of innovation systems in several Asian developing countries neglect important local contexts in which innovation systems operate, particularly the dramatic shift in the broad demographic and economic structures. These changes are related to three influential phenomena: urbanization, globalization, and regionalization. Together these changes carry significant implications for the direction of innovation system development across the Southeast Asian region.

#### **a) Urbanization**

Throughout history, cities have always been the locale of innovation. Cities carry the potential for providing an ideal environment for innovation, as they offer proximity, density and variety. Localization and urbanization economies are achieved through agglomeration of people and ideas in cities. Southeast Asia's urban population will rise to more than 500 million by 2030, and has some of the highest rates of urbanization in the world compared with other developing regions. While this will certainly impose enormous additional pressures on public services, such as streets, utilities and schools, it will at the same time increase market opportunities for local businesses. The megacities

of the Southeast Asian region continue to be the focus of national economic activities, especially those related to science, technology and innovation. The majority of creative, innovative, and entrepreneurial activities in these countries originate in their megacities. Nowhere else in these emerging economies but in their megacities do agglomeration economies promote specialization and knowledge diffusion that drive innovation. The existing and future urban problems constantly call for innovative solutions.

## **b) Globalization**

In addition to the globalization of investment and trade, the information and communication technology revolution is creating individualized, ubiquitously networked economies and societies within and among the Asian megacities. Modalities of creating value have shifted from conventional knowledge and information transfer towards the adoption of global standards; these help to set new global benchmarks for value creation and new lifestyle expectations within megacities. The ongoing transformation of the Southeast Asian region from a resource-based production hub into a regional hub for logistics, services and high quality production and tourism necessitates a new and more complex model of production and service delivery. Such transformation also draws increasing attention to the role of technological innovation in supporting innovation in logistics, knowledge-intensive manufacturing, outsourcing and other sectors.

## **c) Regionalization**

The Southeast Asian region continues to make rapid progress towards economic integration. With trade and investment among the Southeast Asian partners showing significant increases over the past two decades, it is anticipated that a regional institutional framework, including initiatives such as the ASEAN Free Trade Area (AFTA), will sooner or later materialize and render obsolete the current ad hoc patchwork of bilateral agreements. But the pattern of regionalization will not be evenly dispersed. Rather, megacities are likely to further consolidate their dominance as the loci for regional integration in most critical aspects, be they economic, social, political, or institutional. Thus we anticipate that the levels of exchange and flow of technical and business knowledge essential to innovation will not be in non-urban areas or even in the smaller cities: they will overwhelmingly take place only within and among megacities in the region.

### **3. Limited literature and policy on innovation systems at the city level**

Although the body of literature on national and regional innovation systems is already voluminous, there have been surprisingly few studies on innovation systems focusing at the city level. This information gap exists despite the general consensus that cities are “where things happen”. We know that different cities have different degrees of success in building knowledge-based economies. However, some cities are undoubtedly more “innovative” than others, and researchers have long been concerned with finding out why is so. Given that the great majority of innovators, entrepreneurs and knowledge-intensive activities evolve and interact within cities, a new paradigm seems necessary to capture these aspects of innovation systems as well as to generate appropriate and robust policy recommendations. However, relatively little work has been done on the role and influence of the urban environment in stimulating innovation.

Some of the works in this area include the National Endowment for S&T and the Arts (NESTA) study on innovation systems in five cities in England and Germany (Athey, G. et al. 2007). The NESTA study has identified “urban hubs” and “local links” that are connected by urban firms. In urban hubs, scale and choice promote firms’ innovativeness. The size and diversity of population allows businesses to select the optimal combination of suppliers and workers. On the other hand, local links are specialized connections and networks in cities that help firms innovate faster. Proximity allows firms to establish business and knowledge networks which further facilitate knowledge spillovers.

There is another work by Bjorn Johnson and Martin Lehmann on cities as systems of innovation with respect to sustainability (Jonhson and Lehman 2006). They argue that cities constitute relevant environments for interactive learning and innovation potentially capable of tackling sustainability problems. Through a combination of the innovation system approach and the perspective of creative cities, they propose the sustainable city systems of innovation. They argue that there are certain “city-traits” of sustainability and that their concept may be of special use for urban quality development and management

Meanwhile, Richard Florida demonstrates the linkages of cities, creativity and class. He asserts that metropolitan regions with high concentrations of high-tech workers, artists, musicians and a group of "high bohemians" correlate with a higher level of economic development (Florida 2002, 2008). This is because they contribute to an open,

dynamic, personal and professional environment, which in turn, attracts more creative people as well as businesses and capital.

Another strand of literature that touches upon the issues of urban innovation is that of the geography of innovation. A few notable publications include the pioneering work by Maryann Feldman on the geographic dimension to the study of innovation and product commercialization, which proposes a conceptual model that links the location of production innovations to the sources of the knowledge inputs (Feldman 1994). Another work is done by Annalee Saxenian who examines the agglomeration of innovative activities in Silicon Valley in California and along Route 128 in Massachusetts (Saxenian, 1994). A more recent work is an edited volume by Karen Polenske on the economic geography of innovation, with empirical evidence on geographic concentration of innovative activities in various parts of the world (Polenske 2007). To the best of our knowledge, however, there is no existing work on the geography of innovation in the Southeast Asian countries, particularly on the topic of linking innovation geography with urban development and policy.

Another group of studies focus on case studies of innovative solutions to specific urban problems, such as innovative management of water infrastructure (e.g., de Graaf and Brugge 2010), transportation (e.g., Goldman and Gorham 2005; Marchau et al. 2008), and energy (e.g., Zia and Devadas 2007). As these studies are problem-based, the scope of relevant innovation systems tends to be sectoral, even though the locations are urban. Yet, little is known about how individual creativity and its mobilization influence innovation processes within innovation systems in latecomer countries. A very limited number of studies have examined the role of city innovation systems in emerging economies in the world.

#### **4. Need for integration between innovation and urban policies**

Innovation cannot take place in vacuo. Innovation activities require physical space: innovative firms require and prefer physical proximity, creative minds enjoy liveable space, venture capitalists work in financial hubs, knowledge flows require superb infrastructure, industry-university linkages demand efficient logistics and transport networks, etc. Infrastructure and markets as institutions for knowledge creation and diffusion are generally localized in cities. Innovation systems require processes and



incentives to develop linkages among the various actors, and the closer the interactions among the many individual players, the more effective the innovation system as a whole.

Despite the obvious connection between innovation and physical/spatial configuration in cities, relatively few cities have implemented integrated policies combining both innovation and urban/regional development planning. The present conceptual limitation is evident at the policy-making level, particularly in Asia's emerging economies. Their innovation policies are primarily sectoral in scope and national in scale. Most policy-makers in Southeast Asian countries appear to approach the formulation of innovation and urban policies as independent themes. Several countries including Thailand have established science and innovation parks, but they were developed with little consideration of urban problems and urban policy.

Innovation policies in developing economies in Southeast Asia, even when framed within the innovation system concept, are generally not well integrated with other development policies, particularly those addressing the fundamental problems such as infrastructure, environment and poverty alleviation. Institutions as identified in the current literature and included in the innovation-system policies are usually limited to organizations and actors in the areas of science, technology, innovation, and industry. Rarely are agencies related to social and infrastructure development included in the discussion and practice.

Meanwhile, innovations targeted at living environment and poverty alleviation are generally included in the urban policy in an ad hoc and piecemeal fashion, with limited reference to the existing knowledge in the literature of innovation systems and studies. There are some recent examples of integration between innovation and urban development initiatives. For example, Singapore's One North Project, and Malaysia's Multimedia Super-Corridor seriously take into account the integration of innovation and urban development. But these are projects that aim to increase economic competitiveness not urban poverty, liveability, and social equity. There is therefore a clear imperative to develop a framework for integrating policies for innovation with those for urban and infrastructural development as well as the environment in the city.

As long as national innovation policies and their implementation mechanisms do not achieve policy coherence with existing policy contexts, the overall impact will certainly

be constrained in terms of their overall impacts on development and contribution to economic growth, competitiveness, and human development. We notice that, in general, academics and practitioners who are active in the field of innovation policies and systems are interested in sectors that contribute to economic and commercial competitiveness of firms, and research activities that are in line with the global frontiers in science and technology. They pay little attention to the fact that there are many other immediate developmental issues that the ideas and practices of innovation policies and systems can tackle and help solve. A quick scan of the lists of papers presented at the Asialics and other international conferences would find evidence supporting this statement.

These knowledge gaps must be addressed in order to enhance the concept's practical value under varying implementation environments. A detailed analysis of the experience in implementing innovation systems in Asian developing countries could also provide important lessons for emerging economies in other regions, precisely because they share more similarities with one another than they do with the European innovation systems. Therefore, a new conceptual model that target these issues seems both justified and imperative, at a time when policy-makers are not yet ready to fully embrace existing models of innovation systems without tailoring them to fit local contexts.

## **5. Definition of city innovations and the systems**

In defining a city innovation system, a question arises as to whether the concept is the same as that of a regional innovation system. There is already substantial literature on regional innovation systems, which is influenced by the literature of innovation systems and that of regional science (Doloreux and Parto 2005). The concept has grown out of the observation that industrial and innovative activities tend to cluster geographically at the regional level. Many scholars and policy makers believe that the region is the most appropriate scale at which to sustain innovation-driven learning economies (Asheim and Isaksen 1997). Although there are many definitions and ideas about regional innovation systems, in the nutshell, the concept of regional innovation system is a normative and descriptive approach to examining how technological development occurs within a geographical territory.

The concept of city innovation system as proposed in this paper is similar to the existing concept of regional innovation system in many respects. We agree that

innovation occurs in an institutional, political and social contexts, which tend to be geographically bounded. The geographical boundary can either be a region or a city, depending on the definitions of the two terms. Similar to the general concept of regional innovation system, our assumption is also that an innovative activity is a geographical process and that innovation capabilities are sustained through interaction and communication among actors that share common knowledge bases (Asheim and Isaksen 1997; Maskell and Malmberg 1999).

While sharing several assumptions with the regional innovation system literature, we argue that the city is a more appropriate than the region as the scale for analyzing innovation systems in developing countries in Asia. In this regard, the main difference between the concept of city innovation system and regional innovation system depends on the definitions of the terms “city” and “region”. A city is a large human settlement. But the detailed definition of a city varies from one country to another. The physical boundary of each city depends what criteria are used in each country. In many cases, a city, particularly a megacity, covers an area beyond one administrative entity, as in the case of the Bangkok Metropolitan Region and Metro Manila. Although the term “region” is used here to indicate the physical delimitation, the characteristics of the space are urban.

This semantic issue has to do with the patterns of urbanization and city systems in the country in question. The patterns of population and economic agglomeration in many Asian developing countries are very different from those in developed economies in Northern Europe where the concept of regional innovation system was originated. Geographical regions as identified by authors working on regional innovations systems, such as Asheim and Isaksen (1997), are in effect urban regions with low population density. In Europe, urbanization has already reached high levels, and the urban population densities are usually much lower than those in Asian countries. For instance, the current urbanization rate in most developed economies is generally more than 75 percent, while that of Thailand is about 40 percent and almost 30 percent in Vietnam.

In contrast, developing countries are experiencing much higher rates of urbanization, although they are still at much lower urbanization levels than developed economies. Regions in many Asian countries are often characterized by very densely populated cities and their surrounding rural, agricultural areas with limited economic activities in the

secondary and tertiary sectors. In addition, in many Asian countries, the national economies are dominated by “primate” megacities that span beyond administrative boundaries. Although there are megacities with surrounding satellite towns or sub-centers, the economic activities are more densely populated in the urban areas than in developed economies in Northern Europe.

Some scholars, such as Cooke and Schienstock (2000), argue that a well-functioning regional innovation system relies on homogenous economic and social characteristics that distinguish itself from bordering areas. This internal cohesion underlines the systemic interconnectedness and interdependency of the region, which in turns promotes innovativeness and learning of the actors and institutions involved. Whether this assumption is also applicable to city innovation systems remains an empirical question. While city innovations may rely on internal cohesion of communities of urban innovators and other actors to create and diffuse innovative solutions, the requirement for internal homogeneity may matter less when it comes to innovations that are not driven by competition.

In order to conduct research on city innovation systems, we first need to define three key components: namely a city innovation, the space of innovation, and innovators.

## **5.1 City innovation**

Although there are already numerous definitions of innovation, we define city innovation simply and broadly as a new solution that creates additional value to people in the city. Innovation is not just a new idea, but also the articulation and successful implementation of such idea. This is the starting for our defining a city innovation and its system. It can either be technological, institutional and organizational, political and administrative, economic and financial, or social and cultural, so long as it creates additional value to the city by addressing urban challenges. City innovations, therefore, include both commercial innovations as well as social innovations.

What types of value does a new solution need to create in order to qualify as a city innovation? It is probably easier to define value for commercial innovations, as the real test is whether the product/service sells in the market. However, city innovations that are not-for-profit are more difficult to test. People may want different things in their city as they value things differently. There is therefore a larger set of criteria for a city innovation

than the traditional definition of commercial innovation. We propose that the goals of the city innovations should at least aim for economic prosperity, liveability, and social equity. The specific types of value, however, should be determined in each city through participatory, political processes. Following Perlman (1990), some of the criteria for a city innovation may include:

- Novelty: A solution that is relatively new to the city in question. A city innovation does not have to be first in the country or the world.
- Impacts: A solution that has already had noticeable impacts on prosperity and liveability in the city OR has great potential to effect substantial changes to prosperity, liveability, and equity in the city.
- Intra- and inter-generational equity: A solution that improves, or does not worsen, income distribution and social inequality. A city innovation should reach a broader base in the urban population, rather than benefitting only the rich and elite in the society. Meanwhile, the solution should not currently consume resources such that less is left for the future generations.
- Economic and financial feasibility: A solution that is economically and financially feasible. An innovative solution may not be financially feasible from a private investor's perspective, but may still be economically feasible if it benefits the general society.
- Political acceptability: Any solution that is to be adoption in a mass scale needs political acceptance, which means people whose lives are affected participate directly in the decision-making process.
- Transferability: A solution that is socially, culturally, or geographically neutral is more likely to diffuse quickly and widely. However, successful implementation of an innovative idea may rely heavily on social and cultural contexts.

There are a common set of urban problems in megacities in Southeast Asia and there are city innovations that aim to solve them. The city innovations for research on city innovation systems should respond to the existing urban policy arenas. Generally, there are at least ten policy arenas that directly affect prosperity, liveability, and equity in megacities, as follows:

- |                                     |   |
|-------------------------------------|---|
| 1. Employment and income generation | 2. Housing, land use, and built environment |
|-------------------------------------|---|

- |                                     |                                 |
|-------------------------------------|---------------------------------|
| 3. Water and sanitation             | 7. Education and training       |
| 4. Energy                           | 8. Recreation and entertainment |
| 5. Food                             | 9. Public health                |
| 6. Transportation and communication | 10. Safety and security         |

A commercial innovation generally goes through a cycle from idea conception, to trial and error by an innovator, to early adoption by lead users, to widespread diffusion and implementation by the general public. As an innovation becomes a standard routine and/or product, other new ideas and innovations emerge to compete and aspire to become even better. Such life cycle is also applicable to city innovations.

The city innovation systems approach to urban and innovation policies provides opportunities to solve urban problems, as it pays more attention to demand articulation of the innovation consumers and actors involved. This means innovation policies need to be broadened to include actors not traditionally included in science, technology, innovation, and business circles. As the current sphere of innovation systems is rather limited, no voices are heard of the people who need innovative urban solutions, as well as the bottom-of-the pyramid innovators who are left out in the existing policy framework of national and sectoral innovation systems.

## **5.2 Six Dimensions and Three Spaces of Innovations**

In examining city innovations, researchers can start by first asking a few basic questions regarding the creation, adoption, diffusion, and routinization of such innovations. Examples include: Where did the idea come from? How did it start? Who created it? Who first adopted it? Who implemented it? Who made it more successful and widely adopted? Then each of the innovation can be analyzed according to the two distinct conceptual frameworks: the six-dimensions-of-an-innovation framework, and the three-spaces-of-an-innovation framework.

We argue that for an idea to become an innovative solution that creates additional value to the people in the city, several conditions have to be in place or improved from the status quo. In other words, several aspects have to be “innovative” at the same time for an idea to become a city innovation. For instance, the core idea of an innovative solution may be a product, but other aspects have to be innovative as well so that such

idea will be adopted and successfully implemented at a larger scale. These aspects include an innovative way to produce the product (process innovation), to deliver the product to the consumers (service innovation), to have new organizational and institutional structure (organizational and institutional innovations), to change the ways of thinking and doing things (paradigm innovation), or to change the position of the innovation in the market (positioning innovation). This framework of six aspects of city innovations (product, process, service, organizational/institutional, paradigm, position) can be useful in analyzing city innovations that are broadly defined.

Any city innovation can be analyzed with respect to the six aspects. One methodology that can be used in examining a city innovation is the case study approach. Researchers can select the case studies that they consider as innovative solutions to urban problems, then analyze them according to the framework above. The comprehensive framework will allow researchers to capture the systemic characteristics of the city innovation in question. Some example questions include:

- What are the products/processes/services being offered?  
Some innovative solutions may provide the same old products but different ways of delivering the services. Others may use new processes to produce the same old products. In your analysis, please be specific with regards to what are the existing components, what are the new ones.
- Does it involve any new institutional arrangements?  
Innovative solutions often require adjustment and addition to the existing institutional arrangements.
- What are the underlying paradigms and positions of the solution that makes it innovative?

While the above framework allows researchers to examine different aspects of a city innovation, it still does not answer the questions regarding where and how a city innovation takes place. In order to analyze the issue of “place” and city innovation, we propose a three-space framework. We argue that a city innovation necessarily takes place in three types of spaces, namely, cognitive, information, and physical spaces. Cognitive space is the “workspace of the mind” that describes and categorizes thoughts, memories and ideas (Baars 1998). Information space is where individuals communicate and share their thoughts and ideas. Physical space is the natural and built environment in three

linear dimensions that can be perceived by the traditional five senses, that is, sight, hearing, touch, smell, and taste. The understanding of these three spaces would allow researchers to examine not only the innovations but also the innovators and other actors in the communities of innovation systems.

### 5.2.1 Cognitive space

Cognitive space is the starting point for any innovation, as it is the place where humans initiate and organize their thoughts, ideas and memories. The basic unit of cognitive space is the individual who interacts with and makes sense of the surrounding physical environment through information space. Each individual has his/her own unique ways to absorb and exchange information and ideas with other humans and the outside environment. The process we usually call learning occurs in the cognitive space. A cognitive space consists of two elements: the social element, which is the actors involved, and the cognitive element, which is the cognitive matter that each person shares with others. These include, for instance, shared views, symbols, common language use, the common ways-to-do-things (Peverelli 2000).

For the study of city innovation systems, three concepts on learning will help researchers examine cognitive space in the innovation systems, namely: multiple intelligences, learning styles, and the Learning Cycle.

**Multiple Intelligences:** The concept of multiple intelligences has been developed Howard Gardener (Gardner 1983). Gardner's theory argues that intelligence, particularly as it is traditionally defined, does not sufficiently encompass the wide variety of abilities humans display. Different individuals have different sets of intelligences with different combinations and preferences. Gardner proposes eight key intelligences – logical/mathematical, verbal/linguistic, visual/spatial, kinaesthetic, musical/rhythmic, interpersonal, intrapersonal and naturalistic. If we analyze learning processes for city innovations in Asian megacities, we may find that the current concept of innovation systems does not pay attention to various aspects of intelligence. By focusing on formal education and research platforms, we ignore other important aspects of intelligence that may lead to more innovative solutions for urban challenges.

**The Learning Cycle:** According to David Kolb (1984), experience is the source of learning and development and there are two related approaches toward grasping



experience: concrete experience and abstract conceptualization, as well as two related approaches toward transforming experience: reflective observation and active experimentation. According to Kolb's model, the ideal learning process engages all four of these modes in response to situational demands. In order for learning to be effective, all four of these approaches must be incorporated. A common learning cycle involving four separate stages—experience, reflection, generalization, testing—with completion of the full cycle being essential to effective learning. As individuals attempt to use all four approaches, however, they tend to develop strengths in one experience-grasping approach and one experience-transforming approach. The resulting learning styles are combinations of the individual's preferred approaches. This cycle applies equally to learning in an individual, a team or an organization. Each stage of the cycle may benefit from a different environment.

**Learning Styles:** Different individuals have different learning and information processing styles. According to Honey and Mumford (1982), there are four different types of learners, namely, reflector, theorist, pragmatist and activist. Activists are those who tend to seek challenge and immediate experience, are open-minded and do not like implementation. Reflectors are those who gather data, ponder and analyze, delay reaching conclusions, listen before speaking, and usually are thoughtful. Theorists are people who think things through in logical steps, assimilate disparate facts into coherent theories, rationally objective, and reject subjectivity and flippancy. Pragmatists are those who seek and try out new ideas, practical, down-to-earth, enjoy problem solving and decision-making quickly, and do not like long discussions.

In order to understand a city innovation system, we need to examine the characteristics of physical and information spaces that shape the ways innovators and other actors learn. In other words, we need to study the patterns of cognitive and learning processes of the individuals and groups involved in the innovation processes, as well as how they interact with their external environment in the physical and information spaces.

### 5.2.2 Information space

Humans communicate through exchanges of information. Such information exchanges occur in an abstract space that utilizes natural modes, e.g., our mouth, as in case of face-to-face communication and man-made modes, e.g., telephones and the

internet. How the information space is constructed affects the ways and levels of communications among people. Information space is larger than cyber space, which now means anything associated with computers, information technology, and the internet. The structure and components of information space underpin the flows of information and knowledge among people in a city innovation system. It is precisely this in this space that an idea eventually gets adopted and implemented, becomes an innovation, and finally becomes a standard commodity.

In terms of research methodology for city innovation systems, researchers may examine the diffusion mechanisms of an innovation. The questions include: How do innovators/users get relevant information for the creation, adoption and diffusion of city innovations.

### 5.2.3 Physical space

Innovation has to occur somewhere in the physical space, which is the natural and built environment in three linear dimensions that can be perceived by the traditional five senses, that is, sight, hearing, touch, smell, and taste. The standard research questions here include: Where does a city innovation occur? Where does it start? What are the characteristics of urban environment that are conducive to the creation, adoption, and diffusion of city innovations? What is the geographical pattern (concentration and agglomeration, or dispersion) of the innovation, its innovators and other actors involved? One way to examine the physical space for city innovations is to find the locations of innovations, their innovators, and other components in the innovation systems. Another is to find the relationship between the characteristics of the built and natural environment that are related in one way or another with innovative activities and their outcome.

## 5.3 Innovators

Innovations would not be possible without innovators. The current literature of innovation systems pays some attention to innovators and other actors involved in the systems. However, more often than not, firms are the unit of analysis that represents innovators in the existing literature, as is the case in most innovation surveys. Less is known about the roles of individual innovators and communities of innovators who make it happen. In order to capture the systemic nature of innovators and their roles in

innovative solutions, we need to learn more about how these actors in the innovation systems actually do in order to create, adopt, and implement innovative solutions.

In any research on city innovation systems broadly defined, innovators do not limit to private firms but include other actors, such as grassroots and community groups, and co-operative groups. In examining city innovation systems, researchers should broaden the definitions of innovators, as in the reality, there are many different types of people involved in the innovative process. While collectively they are innovators, they play different roles in the process. These include, for instance:

- Idea creators, who imagine what's possible, and tell stories to bring those ideas to life;
- Collaborators, who recognize that innovations need collaboration of people with different backgrounds, interests, and abilities;
- Facilitators and connectors, who bring everyone together so things can move forward;
- Mentors, who help others to learn and discover how to do things better;
- Demonstrators, who show what things are and how they work so the idea and product are adopted and diffused;
- Implementers, who they turn ideas into something concrete and useful;
- Researchers, who explore the new intellectual territories and spread knowledge to others
- Model-builders, who design and build something that can be understood, replicated and adapted by others
- Founders, who take initiatives at new things or different ways of doing things.

#### **5.4 City innovation systems**

Following the general definition of an innovation system, a city innovation system is then defined as a set of formal and informal institutional arrangements, as well as their dynamic interactions, that foster the creation, adoption, and diffusion of city innovations. Here we include other forms of actors and partnerships that have already been identified in the urban planning literature. In addition to the government agencies, educational and research institutions, and private firms (the usual actors in the triple helix concept), city innovation systems should also include non-profit and grassroots groups, which are

important actors in delivering innovative solutions to city residents. Another important actor that should be included in the city innovation systems is the mass media, which plays a critical role in the planning and implementation processes of new ideas and solutions. Innovators should include individual and communities of innovators, not just formal organizations such as research institutes.

## **6. Conclusion**

In this paper, we argue that the current literature of innovation systems and its policy application in several developing economies in Asia is limited. This is not to say that the current knowledge on innovation system is not useful. Quite contrary, we have learned greatly from the previous studies and should build on the existing knowledge, while bringing in other ideas already discussed in other strands of literature and disciplines. We have proposed two conceptual frameworks that can be used in exploring city innovations and their systems; one regarding the six dimensions of an innovation, and the other regarding the three necessary spaces for an innovation to exist. We are hopeful that the communities of scholars and practitioners involving in innovation systems research and policy will broaden the scope of work to include developmental agenda that people in Southeast Asian cities are currently facing.

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