Missing Policy Targets on Knowledge Base and Social Capital for Inclusive Innovation: Existing Gap in Thailand 4.0 Policy

Review of Integrative Business & Economics Research

Kritsada Patluang
School of Economics, University of the Thai Chamber of Commerce

ABSTRACT

This paper is to identify missing policy targets related to social capital and knowledge base formations for inclusive innovations. Based on the survey of 134 Thai tourism community enterprises, marginalized but expanding producers, we employ factor and regression analyses to inspect causal relationships among related variables. Findings include that investments in tool and R&D are bases for goods and process innovations, but training is for services innovation, and "augmented knowledge bases", embracing investments in information technology, design and knowledge transfers, are for all types of innovations. Additionally, the "inherent social capital", comprising levels of collaboration among members and utilisation of business and information networks, engenders services and goods innovations. The "supporting social capital', encompassing the degrees of research network utilisation and of acquaintance/participation with national development agencies, generates all types of innovations. Along the current Thailand 4.0 policy focusing mainly on science- and R&D-based supports, the missing targets for inclusive innovation at the community level and in the service sector include varieties of social capital, training and extended knowledge bases founded above but presently not buttressed by Thailand's science, technology and innovation institutions. Policy adjustments towards these targets are proposed to fulfil the gap existing in the Thailand 4.0 policy.

Keywords: inclusive innovation, social capital, knowledge base, Thailand 4.0 policy

1. INTRODUCTION

Innovation policy is the core of many countries' attempts to increase economic competitiveness and wealth. The current Thailand 4.0 policy, aiming at bringing Thailand into the fourth wave of industrial revolution, also embraces innovation-driven strategies, as a key element among environment-friendly and inclusive strategies for balanced development (Ministry of Industry, 2016; Meksinsee, 2017a, 2017b). Similar to some other governments, the Thai government is targeting mainly on the uplift of education and science and technology (S&T)-based factors, such as research and development (R&D) and other technology-related expenses and personnel, and patents (op cit.) These targets are usually bases for innovations in many manufacturing industries and industrial competition at the S&T frontier.

However, along Schumpeter's (1934) theory of innovation and economic development, making innovation or "new combinations" out of old knowledge or ways of doing things also results in considerable competitiveness, growth and wealth of nation. Countries such as Japan and South Korea have proved this, as they had made innovations behind the S&T frontier based on old technologies before they have fully

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

invested in S&T-based personnel and expenses for new technologies in competing at the frontier (Freeman, 1987; Kim, 1997). The economic innovations by new combinations of old knowledge and ways of doing things are important to innovation developments in the service and other sectors that not rely essentially on investment in R&D- and S&T-based resources (Miles, 2005; Miles, Green, and Jones 2007). In addition, innovations may come from other sources of innovations, including user-producer interaction and learning (Lundvall, 1988) and networks within economic clusters (Porter, 1985; OECD, 1999) and/or within innovation systems (Freeman, 1987; Lundvall, 1988; OECD, 1997). These concepts overlap with the network notion of social capital and its contributions to innovation. The network social capital framework stresses the "level of strength" of networks which should increase exchanges and new combinations of resources as well as knowledge sharing and interactive learning (Moran and Ghoshal, 1996; Molina-Morales et al, 2010; Perez-Luno et al, 2011; Cuevas-Rodriguez et al, 2013).

Therefore, to make the innovation-driven policy also inclusive for marginalized producers and complete, other policy targets not included in R&D and other S&T factors but necessary for innovation developments in the expanding service and other marginal sectors must be identified and established for government policies and supports (OECD, 2013; Heeks et al., 2014). A preliminary report on the survey of knowledge and innovation development of Thai tourism community enterprises (which compose of networks of micro enterprises at the community level in the tourism sector) reveals that social capitals and knowledge bases other than R&D--such as training and knowledge transfers--have intensively coincided with the enterprises' innovations (Patluang, 2012). These enterprises can be representatives of about 1.4 million of community enterprises and of about 2.7 million of small and medium enterprises across Thailand currently receiving scanty innovative supports from traditional science, technology and innovation institutes (op cit.). A methodical study of the community enterprises' sources of innovations and their effects here is thus an important basis for further, appropriate policy targeting and is expected to be applicable to other cases of service and borderline sectors in other countries.

Based on the review of knowledge base and social capital literature, Section 2 theorises potential impacts of categories of knowledge bases and social capitals on innovations. Section 3 elaborates the source and measures of data. Section 4 provides measurement analysis of latent variables constructed by a factor analysis and scrutinises the results of a regression analysis on the latent variables, to identify important knowledge bases and social capitals that significantly engender particular innovations. Section 5 provides conclusion and implications related to policy targeting that may help to bridge the gap of the current Thailand 4.0 innovation-driven policy.

2. THEORETICAL BACKGROUND

2.1 Different Categories of Knowledge Bases and Their Positive Effects on Innovations

The innovation literature points to different types of knowledge base as different sources of innovation. We will carry out the literature review on groups of knowledge bases and their impacts on innovations, based on whether they are basic targets of innovation policies (including of Thailand 4.0) or not.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

2.1.1 Basic knowledge bases

The first group of basic knowledge-based targets is *R&D expenditures and investments*. Representing the search for and use of new technical knowledge at the S&T frontier, they are accentuated by traditional economics as a core determinant of industrial innovation (OECD, 1992). In econometric studies, expenditures on and stocks of R&D (knowledge) significantly affect productivity growth and innovation (Griliches, 1979; Mansfield, 1984; Verspagen, 2005). These are a basis for including R&D expenditures, investments and related elements as indicators of innovation input in community innovation surveys of many leading countries and in OECD/Eurostat's (1992, 2005) innovation survey handbooks, which later are also applied to the innovation surveys in developing countries behind the S&T frontier. Importantly, the literature on technological absorptive capacity, extended that R&D is also used as a tool to assimilate, learning and exploit new and old external knowledge as well as to imitate new product and process innovations (Cohen and Levinthal, 1989; OECD, 1992; Noni et al., 2013). This expansion is additional root for the survey and measurement of R&D and R&D-related elements within organisations behind the S&T frontier, assuming that they also have significant impacts on the organisations' innovation outputs and performances. A model of innovation based mainly on in-house R&D is called a close model, which is opposite of the open innovation model (Chesbrough, 2003; Mitcova, 2014).

The second group includes *investments in machine and tool*, which are strongly connected to the above role of R&D in bringing about innovations. This tradition is derived from Solow's (1960) work, theorising that different vintages of capital goods embody technological advances, the newer vintages with higher quality than the older. The work has been stretched by Romer (1990), Grossman and Helpman (1991) and Agion and Howitt (1992) as "endogenous or new growth models". These models make R&D investments endogenous in the growth equation resulting in new and/or varieties of capital goods used for the production of consumer goods (Verspagen, 2005), which are new and/or improved in quality. Therefore, innovations can be resulted from the use of such new-technology-embodied machine. Given this reasoning, developing countries could upgrade their technological capabilities and innovations by accessing and learning to use new machines and tools and their related components, in addition to other direct disembodied knowledge transfers (Dahlman et al, 1987; Enos and Park, 1988). It is then usual to include the investment in machine and tool in innovation surveys in developed and emerging counties alike.

2.1.2 Other knowledge bases

Training, internally or externally, is another knowledge base inspected in community innovation surveys in developed countries although the surveyed target is

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

mainly the training for specific personnel related to the development and/or introduction of innovations. This is because new technologies require a combination of new and or specific skills for generating innovations. However, innovation surveys in OECD countries also demonstrate that sectors and firms with more highly educated workers are expected to be more innovative (Miles, 2005; Miles, Green, and Jones 2007). Empirical analyses based on firm surveys in various countries show that the share of firms that provide in-service training is significantly correlated with innovation (Tan and Savchenko, 2007; Tan, 2008; World Bank, 2010). For the marginalized enterprises generally need external assistances for training, training is anticipated to support their innovation developments.

The second group of other knowledge bases includes *Design*. It is an additional indicator of innovation input usually included in innovation surveys. According to Kline and Rosenberg (1986), analytic and detailed designs and redesigns of products and processes are core elements of overall innovation process, bridging research and S&T knowledge to market. Specifically, design defines procedures required for the development of new products and processes (OECD, 1992; OECD/Eurostat, 1992). In the literature on latecomer industrial development, catching-up firms in emerging countries, after assimilating and utilising technological capabilities for continued technological upgrading, they learn to develop product design skills, which are required for developing new products and process (Wortzel and Wortzel, 1981; Hobday, 1995). Along these lines, we may look for and collect the data on design activity of the surveyed enterprises below to gauge their effects on forms of inclusive innovation.

The third group of other knowledge bases embraces *investments in information and communication technology (ICT) equipment* are also expected to contribute to varieties of innovations, given their incessantly rising roles in economic and industrial developments since the 1980s. Studies were done under the growth accounting and econometric methods to account for ICT equipment as a new vintage or a specific stock of capital but found its negligible effect on productivity growth during the 1980s. This is termed “Solow Paradox” under which organisational transformation as a result of ICT was not considered (Brynjolfsson and Hitt, 2000). However, given old and new technologies connected to all activities along the value chain of the firm, the ICT equipment improves linkages and flows and uses of technology and knowledge, resulting in new ways of product and process developments (Porter, 1985) as well as the improvement in the above innovation process from research to design and to market. These arguments are true not only within the manufacturing sector but also within the service sector where innovative use of ICT starts from improved efficiency and quality to new services (Barras, 1986; Miles, 2005). After all, ICT

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

can make new services innovation trajectories (Miles, 2005). With the rising digital ICT accessible even to marginal enterprises, we may also look for and collect the data of ICT investments for the analysis of their effects on innovations.

Apart from the above self-investment and self-development, *formal and informal knowledge transfers* within and from external counterparts are expected to support enterprises' innovations. Initially, formal disembodied knowledge transfers are the chief means for firms behind the technology frontier obtaining technologies and innovative capabilities, whether they are bought in the form of licensing or formal technical assistances (Dahlman et al, 1987; Enos and Park, 1988; Mohan and Zhao, 1990; Hobday, 1995). All of these can be included in systematic knowledge transfer categories, such as university transferring to enterprises (Anatan, 2013), which marginal enterprises may also obtain through the supports of government and non-government institutions. As tacit knowledge become increasingly important, however, informal knowledge transfers within and between enterprises through operation and business networks or spillovers within industrial clusters may cause important innovations (Lundvall, 1988; Porter, 1985; OECD, 1999). The informal form of knowledge transfers may occur between borderline micro enterprises within community enterprises, which will be marginal representative enterprises we study below. The data on both kinds of knowledge transfers are thus important for the analysis of the impacts of the enterprises' knowledge bases on their innovations.

2.2 Different Categories of Social Capital and Their Positive Effects on Innovations

In the literature, three main dimensions of social capital have been studied, and each of which is hypothetical assumed to yield positive effects on innovation, productivity and social and economic development as well as social integrations (Putnam, 1995; Woolcock, 1998; Narayan, 1999; World Bank, 2002). The first dimension is the *cognitive dimension*, including trust, norm and shared vision, is presumed to assist reducing uncertainty, complexity and transaction costs of resource and knowledge exchange and recombination, thereby leading to the increase in innovation incidences (Moran and Ghoshal, 1996; Maskell, 2000; Cuevas-Rodriguez et al., 2013; Noni et al., 2013, Gupta et al., 2014). The second dimension is "*weak ties*" or "*structural social capital*" involving hierarchical and sparse connectivity of networks exposed for flows of diverse knowledge and information, which also bring in the increase in innovation incidences (Granovetter, 1973; Burt, 1992; Hansen, 1999). The final dimension is "*strong ties*" or "*relational social capital*", which overlaps with the above cognitive dimension (Noni et al., 2013, Gupta et al., 2014) because it also involves trust and shared norm as well as strong and good quality of

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

relations through networks, which strengthen the transformation and sharing of knowledge and lead to innovation (Coleman, 1988; Adler and Kwon, 2002; Moran, 2005; Perez-Luno et al., 2011).

In addition, the interaction and cohesion within the organisation are of relational dimension and also called *"bonding tie"*. The interaction with external counterparts are of structural dimension and also called *"bridging tie"* social capitals (Woolcock, 1998; Narayan, 1999; World Bank, 2002). With the above literature, we finally make a general hypothesis that each type of social capital yields positive effects on innovation. In Section 3 below we will identify and collect the representative data of knowledge bases, social capitals and innovations of marginalized enterprises, to testify in Section 4 whether each type of the knowledge bases and social capitals contributes to (and thus should be a target for generating) inclusive innovation.

3. METHODOLOGY

3.1 Representative Case and Data Collection

The Thai tourism community enterprises suitably represent peripheral groups of enterprises that seldom possess sufficient innovation capabilities and require innovation supports under inclusive innovation schemes. Legally in Thailand a community enterprise is made of at least 7 individual or household microenterprises. They mostly situate in rural and suburban areas and group together for mutual and external exchanges and supports. Compared with bigger enterprises, they are more counted by government and non-government agencies as targets for financial and other economic assistances. For the present case of tourism community enterprises, they also denote the microenterprises in the service sector which usually obtain measly innovative assistances from conventional science, technology and innovation institutes.

Data collection for this study is a four-yearly update on the previous survey carried out between August and October 2012 under a project supported by the National Research Council of Thailand's (NRCT) fund, in which a cross-country sample of 178 out of the total population of 345 tourism community enterprises registered with Thailand's Ministry of Agriculture was randomly sampled (with the margin of error approximating 5.2%) to complete six-paged questionnaires on their knowledge bases, social capitals and innovations. Using the previous connections, the author recollected the same categories of data between October 2016 and January 2017, initially for preparing a preliminary comparison report. However, in this later time only 134 out of the previous 178 tourism community enterprises are accessible to provide the data (with the margin of error now increasing to 6.8%). Note that all the

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

data on knowledge bases, social capitals and innovations encompass what have happened within four years.

3.2 Preliminary Measures

3.2.1 Knowledge base variables

In line with the OECD/Eurostat's (2005) manual, the knowledge base variables measured include investment in tool and machine, investment in information and communication technology, training, product design activity, and R&D. Their values are reported either as 1 (have) or 0 (have not). Also, we add in as knowledge bases the levels of knowledge transferred informally, systematically and through training, of which the value are to be evaluated to show strength within the range of 1 (low) to 4 (highest) on the Likert scale.

3.2.2 Social capital variables

Following Landry et al (2002), we include some social capital variables for the study to reflect all network dimensions of social capital. The value of these variables are also to be evaluated to show strength within the range of 1 (low) to 4 (highest) on the Likert scale. They include: the level of business network utilisation, the level of research network utilisation, the level of information network utilisation, the degree of acquaintance with representatives of local agencies, the degree of participation with associations at the local level, the degree of acquaintance with representatives of national agencies, the degree of participation with associations at the national level, and the degree of collaboration within the community enterprise.

3.2.3 Innovation variables

Also along the lines of OECD/Eurostat's (2005) manual, the innovation variables measured include new goods but old in the market, significant improvement in goods quality, new services but old in the market, significant improvement in services quality, new or significantly improved production processes, of which their values are reported either as 1 (have) or 0 (have not). In addition, the simple numbers of all the above innovation variables are to be measured. In this study we focus only on these product and process innovations because they are primary innovations that help the community enterprises to enter new branches of markets and transform their competitive production structures.

3.2.4 Control variables

Given that the size and age of enterprises may have discriminated effects on innovation performances of the community enterprises, we also measure them. The number of members of the enterprises in natural logarithm form and years in operation will be used respectively as measures for size and age, in consistent with the

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

literature (Molina-Morales et al, 2010; Perez-Luno et al, 2011; Cuevas-Rodriguez et al, 2013).

3.3 Analysis Techniques

We will initially employ a factor analysis on all the above variables so that data-generated latent variables representing each categories of knowledge bases, social capitals, and innovations can be obtained. This is to handle too many variables which may also cause multicollinearlity in a subsequent regression analysis. But, the resulted latent factors have also to be consistent with theoretical grounds of each policy variable. Finally, we apply a regression analysis of the knowledge base and social capital latent factors and control variables on the innovation latent factors to find their causal relationships.

4. RESULTS

4.1 Measurement Analysis

Firstly, all the variables are tested for sampling adequacy. The Bartlett's test of sphericity for the variables is signigicant at the 0.01 level and the Kaiser-Meyer-Olkin value is 0.718, higher than 0.7, thereby guaranteeing sampling adequacy (Palmberg, 2004). Table 1 reveals all the factor loadings, which are the result of an exploratory factor analysis to bring about convergent validity of each latent variable or factor by employing principle axis factoring, selecting factors with eigenvalues greater than one, and running a varimax rotation (Cuevas-Rodriguez et al, 2013). Each column of the table constitutes a latent factor in which each variable with the factor loading (also reflecting the correlation of the variable with the factor) in bold constitute the component of the latent factor, as its factor loading with other factors are smaller. A factor loading value of 0.3 is used as a minimum level for including in the factor, given the value below 0.3 is considered insignificant, the value higher than 0.4 is important and higher than 0.5 is significant (Hair et al, 1998; van Hemert et al, 2013). The Cronbach's alpha values of 0.611, 0.658 and 0.803 for the multiple-item knowledge base variables, social capital variables and innovation variables, respectively, assure the validity of aggregation being within the limits of tolerance suggested in the literature (Malhotra, 1997; Molina-Morales and Martinez-Fernandez, 2010).

Subsequently, we have three knowledge base factors termed "basic knowledge base", comprising R&D activity and investment in tool and machine, "extended knowledge base", encompassing product design activity and levels of informal and systematic knowledge transfers, and "training", including training activity and the

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

level of knowledge transferred through training. The basic knowledge base factor is consistent with what the conventional innovation policy settings, including Thailand 4.0, generally target as the fundamental knowledge base for innovation. Other missing knowledge-based policy targets are then combined within the extended knowledge base and training factors. The former is more complex and needs to be augmented or extended from routine uses of knowledge. The latter is simple but able to generate typical innovations in the service sector.

In addition, we have three social capital latent factors, all of them considered missing targets within conventional innovation policy settings. Based on both conceptual and statistic instruments, the derived categories of social capital are new to the literature. Grouping the degrees of acquaintance with and participation to local development agencies entities within the "local supporting social capital" is belong to the social capital concept of "embeddedness", which connects enterprises or individuals to local public organisations or officials (Evans, 1995; Woolcock, 1998; Narayan, 1999). But, classifying the collaboration within the community enterprise and the utilisations of business and information networks within the "inherent social capital" and categorising the utilisation of research network and the degrees of acquaintance with and participation to representatives of national development agencies within the "core supporting social capital" are new contributions. They are expected to provide new analytical investigation and connotation related to the social capital issues. That is, the degree of collaboration within the community enterprise and the utilisations of business and information networks can be naturally pursued by any enterprise with networks. The core supporting social capital, on the other hand, could be obtainable only within a centralised developmental state expanding kinds of its national agencies across country to support economic development. Note that the (local and core) "supporting" term signifies that each dimension of social capital does not naturally occur to enterprises in their routine operations, but tacitly brought about by external organisations at local and/or national levels that partly carry out development supporting functions. These organisations generally possess and/or connect to knowledge and technical apprentices that potentially bring about innovations.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Table 1: Factor analysis for latent variables

Knowledge base latent variables:			
(Factor loading in bold; cumulative variance explained = 60.13%)	Basic knowledge base	Extended knowledge base	Training
R&D activity	**.815**		
Investment in tool and machine	**.699**	-.189	.366
Investment in information and communication technology		**.559**	-.174
Product design activity	.424	**.517**	-.197
Level of systematic knowledge transfer		**.673**	.148
Level of informal knowledge transfer		**.702**	.122
Training activity			**.880**
Level of knowledge transfer through training		.445	**.775**
% of variance explained	22.10	20.62	17.41
Social capital latent variables:			
(Factor loading in bold; cumulative variance explained = 60.13%)	Inherent social capital	Local supporting social capital	Core supporting social capital
Degree of collaboration within the community enterprise	**.647**		
Level of business network utilisation	**.467**		.425
Level of information network utilisation	**.461**		
Degree of acquaintance with representatives of local agencies	-.430	**.725**	
Degree of participation with associations at the local level		**.653**	.570
Degree of acquaintance with representatives of national agencies			**.707**
Degree of participation with associations at the national level			**.752**
Level of research network utilisation			**.753**
% of variance explained	24.79	19.87	18.35

Below, we have four innovation latent factors: goods innovation, goods quality innovation, services innovation and process innovation. They are the result of data-generating but also conceptually consistent. Good innovation, including new goods but old in the market and the number of it, and goods quality innovation, including significant improvement in goods quality and the number of it, could be significantly discriminated, given that former is distinctly more radical. On the other hand, new services but old in the market and significant improvement in services quality and the number of them are not that stringently distinct. Having all in the same services innovation factor here is sufficient for our purpose in testing the effects of any knowledge base and/or social capital on the services innovation. To end,

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

process innovation embrace significantly improved production processes and the number of it.

Table 1: Factor analysis for latent variables (continued)

Innovation latent variables: (Factor loading in bold; cumulative variance explained = 60.13%)	Services innovation	Goods innovation	Goods Quality innovation	Process innovation
New services but old in the market	**.585**	.227	-.523	.218
Number of new services but old in the market	**.717**	.257	-.317	.114
Significant improvement in services quality	**.865**	-.172		
Number of significant improvement in services quality	**.886**		.181	
New goods but old in the market	.124	**.872**		
Number of new goods but old in the market	-.132	**.771**	.326	
Significant improvement in goods quality	.128	.349	**.768**	
Number of significant improvement in goods quality		.152	**.865**	
New or significantly improved production processes				**.958**
Number of new or significantly improved production processes	.143			**.940**
% of variance explained	24.62	16.55	18.63	18.75

4.2 Regression Analysis

As revealed in Table 2 below, four regressions of each innovation factor on the knowledge base and social capital factors can be used to estimate their causal relationships, given all the F-statistic values significant at least at the 0.05 levels of significance (although they are not fitted for forecasting the values of each innovations due to low R-square values). With respect to the controlled variables, except a negative relationship between years in operation and services innovation, they generally have no significant effects on innovations, just consistent with most of the related literature (Molina-Morales et al, 2010; Perez-Luno et al, 2011; Cuevas-Rodriguez et al, 2013).

The regressions confirm the notion that conventional, basic knowledge base provides significant positive impacts on certain product (goods and goods quality) and process innovations of enterprises although the levels of significance for its impact on goods quality is at 0.1 level, relatively weak compared to at 0.01 level on both goods and process innovations. Importantly, its effect on services innovation, the other part of product innovation, is not significant. Likewise, training has significant positive impacts on only goods and services innovations although the level of

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

significance for its impacts on goods innovations is at 0.1 level, relatively weak compared to at 0.01 level on service innovations. It has no significant impact on goods quality and process innovations.

Table 2: Impacts of different knowledge bases and social capitals on different innovations

Dependent variables:	Goods innovation	Goods quality innovation	Services innovation	Process innovation
Constant	-0.053	0.403	1.094	-0.560
Control variables				
Number of members	0.160	-0.096	0.134	-0.032
Year in operation	-0.001	-0.018	-0.139*	-0.103
Knowledge base variables				
Basic knowledge base	0.235**	0.149*	.058	0.363***
Extended knowledge base	0.201**	0.146*	0.203**	0.177*
Training	0.173*	0.09	0.268***	0.039
Social capital variables				
Inherent social capital	0.219**	0.103	0.146*	0.108
Local supporting social capital	0.056	0.015	0.014	0.023
Core supporting social capital	0.191**	0.215**	0.337***	0.172**
Adjusted R^2	0.157	0.140	0.246	0.182
F Statistic	2.913**	2.740**	5.093***	3.478***

significant at 0.10 level*; * significant at 0.05 level*; **** significant at 0.01 level*

On the other hand, the extended knowledge base has significant positive impacts on all kinds of innovation although the levels of significance for its impacts on goods quality and process innovations are at 0.1 level, relatively weak compared to at 0.05 level on both goods and service innovations. On the social capital front, the most influential one is core supporting social capital, which provides significant positive effects, at the 0.05 to 0.01 levels of significance. The inherent social capital positively affects only on goods and services innovations at the 0.1 and 0.05 levels of significance, respectively. In contrast, local supporting social capital has no significant impact on all kinds of innovation.

5. CONCLUSION AND POLICY IMPLICATIONS

The above findings support our attempt to identify that there are some missing policy targets necessary for the creation of inclusive innovation among marginalized producers, and so of innovation-driven development under the Thailand 4.0 policy. Without innovation developments across-the-board, including those of millions of micro and small enterprises and of a great portion of service industries, a country with the service-led structure like Thailand will hardly attain a position of innovative country. As theoretically reviewed in Section 2, apart from scientific-based factors

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

generally targeted for the creation of innovations, there are plentiful elements that can be targeted as bases for the development of innovation of these groups of enterprises and sectors. These elements include many types of knowledge transfers, training and social capitals.

More specifically, the missing targets identified by the empirical analysis in Section 4 include training and knowledge transfers through training, which are combined as training factor required for services and, to a lesser degree, goods innovations. They are also informal and systematic knowledge transfers, design activity and the investment in information technology, combined within the extended knowledge base factor, which positively and significantly affect all sorts of product and process innovations. Unlike R&D explicitly stated as a policy target for the making of innovation within Thailand 4.0, these elements are generally not included in Thailand's specific and/or effective innovation plans and policies. Earlier descriptive report (Patluang, 2012) reveals that part of the training and knowledge transfers come from national departments and agencies that usually function for the purposes other than research and innovation developments, yet indirectly affecting the community enterprises' innovation performances. Just as design activity and investment in information technology that should be deliberately and more holistically incentivised and scaled up by development programmes (coordinated by all related government agencies), so do these training and knowledge transfers. In tandem with R&D, investment in tools and machine (which is presently not targeted under Thailand 4.0 policy) should receive incentives and supports for its expansion as mechanism for innovation.

Overlapping with the above knowledge base targets are other two missing targets, namely the degrees of acquaintance and of participation with representatives of national agencies. The two variables are combined with the level of research network utilisation (already be a policy target) to make the core supporting social capital factor, which here positively and significantly affect all categories of product and process innovations. The combination does not complicate the policy setting since all the three variables in the core supporting social capital are routinely supported by the national government (Patluang, 2012). The holistic coordination of all related government agencies for specific innovation support through these targets is also proposed. For the inherent social capital, embracing the collaboration within the community enterprise and the utilisations of business and information networks that positively and significantly affect goods and services innovations, the government could by incentives and/or assistances accelerate the formation of and the collaboration within community enterprises, which speed up flows of information, as well as their investment in and usage of information technology. The support of networking between the community enterprises and their business partners along the value chain may also be scaled up.

Respecting limitation, this study is founded on the compound latent factors, which sacrifice scrutinising on individual effects of each variable within the factor. Yet, at this more aggregated level, we expect that the policy recommendations derived are not only beneficial for bridging the gap existing in the Thailand 4.0 innovation policy but also usefully applicable to other cases of innovation uplifting policy for service and borderline sectors in other countries.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

REFERENCES

[1] Abreu, M., Grinevicha, V., Kitsona, M. and Savon, M. (2010), "Policies to enhance the 'hidden innovation' in services: evidence and lessons from the UK", *The Service Industries Journal*, 30(1), 99–118.
[2] Adler, P.S., Kwon, S.W. (2002), "Social capital: prospects for a new concept", *The Academy of Management Review*, 27(1), 17-40.
[3] Agion, P., Howitt, P. (1992), "A model of growth through creative destruction", *Econometrica*, 60, 323-351.
[4] Anatan, L. (2013), "A proposed framework of university to industry knowledge transfer", *Review of Integrative Business and Economics Research*, 2(2), 304-325.
[5] Barras, R. (1986), "Towards a theory of innovation in services', *Research Policy*, 15(4), 161-173.
[6] Brynjolfsson, E., Hitt, L.M. (2000), "Beyond computation: information technology, organizational transformation and business performance", *Journal of Economic Perspectives*, 14(4), 23-48.
[7] Burt, R. (1992), *Structural Holes: The Social Structure of Competition*, Harvard University Press, Cambridge, Massachusetts.
[8] Chesbrough, H. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston.
[9] Cohen, W.M., Levinthal, D.A. (1989), "Innovation and learning: the two faces of R&D", *Economic Journal*, 99(397), 569-596.
[10] Coleman, J. (1988), "Social capital in the creation of human capital", *American Journal of Sociology*, 94, S95-S120.
[11] Cuevas-Rodriguez, G., Cabello-Medina, C., Carmona-Lavado, A. (2014), "Internal and external social capital for radical product innovation: do they always work well together?", *British Journal of Management*, 25(2), 266-284.
[12] Dahlman, C.J., Ross-Larson, B., Wesphal, L.E. (1987), "Managing technological development: lessons from the newly industrializing countries", *World Development*, 15(6), 759-775.
[13] Edelman, L.F., Bresnen, M., Newell, S., Scarbrough, H., Swan, J. (2004), "The benefits and pitfalls of social capital: empirical evidence from two organizations in the United States", *British Journal of Management*, 15, S50-S69.
[14] Enos, J.L., Park, W.H. (1988), "The adoption and diffusion of imported technology: the case of Korea", Croom Helm, London.
[15] Evans, P. (1995), *Embedded Autonomy: States and Industrial Transformation*, Princeton University Press, Princeton, NJ.
[16] Freeman, C. (1987), *Technology Policy and Economic Performance: Lessons from Japan*, Pinter, London.
[17] Granovetter, M. (1973), "The strength of weak ties", *American Journal of Sociology*, 78(6), 1360-1380.
[18] Griliches, Z. (1979), "Issues in assessing the contribution of research and development to productivity growth", *The Bell Journal of Economics*, 10, 92-116.
[19] Grossman, G.M., Helpman, E. (1991), *Innovation and Growth in the Global Economy*, MIT Press, Cambridge, MA.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

[20] Gupta, M., Choudhary, A.K., Alam, M.S. (2014), "Effect of trust, satisfaction and other relationship dimensions on supplier relationship management", *Review of Integrative Business and Economics Research*, 3(2), 17-30.

[21] Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C. (1998), *Multivariate data Analysis*, Prentice Hall, Upper Saddle River.

[22] Hansen, M.T. (1999), "The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits", *Administrative Science Quarterly*, 44(1), 82-111.

[23] Heek, R., Foster, C., Nugroho, Y. (2014), "New models of inclusive innovation for development", *Innovation and Development*, 7(1), 75-185.

[24] Hobday, M. (1995), *Innovation in East Asia: The Challenge to Japan*, Edward Elgar, Cheltenham, U.K.

[25] Kim, L. (1997), *Imitation to Innovation: The Dynamics of Korea's Technological Learning*, Harvard Business School Press, Boston, Massachusetts.

[26] Kline, S.J., Rosenberg, N. (1986), "An overview of innovation", in National Academy of Engineer, *The Positive Sum Strategies: Harnessing Technology for Economic Growth*, The National Academy Press, Washington, D.C.

[27] Landry, R., Amara, N., Lamari, M. (2002), "Does social capital determines innovation? To what extent?", *Technological Forecasting and Social Change*, 69(7), 681–701.

[28] Lundvall, B.-Å. (1988), "Innovation as an interactive process: from user-producer interaction to the national innovation system", in Dosi, G., Freeman, C., Nelson, R. R., Silverberg, G., Soete, L. (eds.), *Technology and Economic Theory*, Pinter, London.

[29] Maesincee, S. (2017a), "Thailand 4.0: thriving in the 21st century through security, prosperity & sustainability", Address to the American Chamber of Commerce in Thailand. 26 January 2017. Conrad Bangkok Hotel, Bangkok, Thailand.

[30] Maesincee, S. (2017b), "Thailand 4.0", Lecture at the Asian Institute of Technology (AIT). 30 August 2016. Bangkok, Thailand. http://livebroadcast.ait.ac.th/special_lecture/dr_suvit.html (Accessed 1 March 2017)

[31] Malhotra, N.K. (1997), *Marketing Research: An Applied Orientation*, Prentice Hall, New York.

[32] Mansfield, E. (1984), "R&D and innovation: some empirical findings", in Griliches, Z. (ed.), *R&D, Patents and Productivity*, Chicago University Press, Chicago.

[33] Maskell, P. (2000), "Social capital, innovation and competitiveness", in Baron, S., Field, J., Schuller, T. (eds.), *Social Capital: Critical Perspectives.* Oxford University Press, Oxford.

[34] Miles, I. (2005), "Innovation in services", in Fagerberg, J., Mowery, D., Nelson, R. (eds.), *The Oxford Handbook of Innovation*, Oxford University Press, New York.

[35] Miles, I., Green, L., Jones, B. (2007), "Mini study 02: skills for innovation", *Global Review of Innovation Intelligence and Policy Studies*, INNO GRIPS Europe, Brussels.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

[36] Ministry of Industry. (2016), *20-year Strategy for Development of Thai Industry 4.0 (2017-2038).* Ministry of Industry, Thailand, Bangkok.

[37] Mitcova, L. (2014), "Implementation of open innovation model: Organizational approach" *Review of Integrative Business and Economics Research,* 3(2), 77-87.

[38] Mohan, R.N., Zhao, L. (1990), "International technology transfer: a review", *Research Policy,* 19, 285–307.

[39] Molina-Morales, F.X., Martinez-Fernandez, M.T. (2010), "Social networks: effects of social capital on firm innovation", *Journal of Small Business Management,* 48(2), 258-279.

[40] Moran, P. (2005), "Structural VS. relational embeddedness: social capital and managerial performances", *Strategic Management Journal,* 26, 1129-1151.

[41] Moran, P., Ghoshal, S. (1996), "Value creation by firms", *Academy of Management Best Paper Proceedings,* 41-45.

[42] Narayan, D. (1999), "Bonds and bridges: social capital and poverty", Policy Research Working Paper No. 2167, World Bank, Washington, D.C.

[43] NESTA. (2007), *Hidden Innovation.* National Endowment for Science, Technology and the Arts, London.

[44] Noni, I.D., Ganzaroli, A., Orsi, L., Roberta, A. (2013), "Innovation, absorptive capacity, environmental complexity, trust and cooperation within clusters", *Review of Integrative Business and Economics Research,* 2(1), 276-291.

[45] OECD.)1992(, *Technology and the Economy: The Key Relationships,* OECD, Paris.

[46] OECD. (1997), *National Systems of Innovation,* OECD, Paris.

[47] OECD.)1999(, *Boosting Innovation: The Cluster Approach,* OECD, Paris.

[48] OECD. (2013), *Innovation and Inclusive Development,* OECD, Paris.

[49] OECD/Eurostat. (1992), *OSLO Manual: Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, 1st ed.*, OECD/Euro Stat, Paris.

[50] OECD/Eurostat. (2005), *OSLO Manual: Guidelines for Collecting and Interpreting Innovation Data,* 3rd ed. OECD/Euro Stat, Paris.

[51] Palmberg, C. (2004), "The sources of innovations- looking beyond technological opportunities", *Economics of Innovation and New Technology,* 31(2), 183-197.

[52] Patluang, K. (2012), *Social Capitals, Networks, and Knowledge and Innovation Management in Thailand's Tourism Community Enterprises: Policy Implications,* Report Submit to National Research Council of Thailand, National Research Council of Thailand, Bangkok.

[53] Perez-Luno, A., Medina, C.C., Lavado, A.C., Rodiguez, G.C (2011), "How social capital and knowledge affect innovation", *Journal of Business Research,* 64, 1369-1376.

[54] Porter, M.E. (1985), "Technology and competitive advantage", *Journal of Business Strategy,* 5(3), 60-78.

[55] Putnam, R. (1995), "Bowling slone: America's declining social capital", *Journal of Democracy,* 6, 65-78.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

[56] Romer, P. (1990), "Endogenous technological change", *Journal of Political Economy*, 98, s71-s102.

[57] Schumpeter, J.A. (1934), *Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle,* Harvard University Press, Cambridge, Massachusetts.

[58] Solow, R. (1960), "Investment and technical progress", in Arrow, K., Karlin, S., Suppes, P. (eds.), *Mathematical Methods in Social Sciences,* Stanford University Press, Stanford, CA.

[59] Tan, H. (2008), "Skills, training policies and economic performance: international perspectives". Paper presented at the World Bank Labor Market Policy Course. Jobs for a Globalizing World. March 31–April 11. World Bank, Washington, DC.

[60] Tan, H., Savchenko, Y. (2007), *Skills shortages and training in Russian enterprise,* World Bank Policy Research Working Paper 4222, World Bank, Washington, DC.

[61] van Hemert, P., Nijkamp, P., Masurel, E. (2013), "From innovation to commercialization through networks and agglomeration: analysis of sources of innovations, innovation capabilities and performance of Dutch SMEs", *Annals of Regional Science,* 50, 425-452.

[62] Verspagen, B. (2005), "Innovation and economic growth", in Fagerberg, J., Mowery, D., Nelson, R. (eds.), *The Oxford Handbook of Innovation,* Oxford University Press, New York.

[63] Woolcock, M. (1998), "Social capital and economic development: toward a theoretical synthesis and policy framework", *Theory and Society,* 27(2), 151-208.

[64] World Bank. (2002), *Understanding and Measuring Social Capital,* World Bank, Washington, D.C.

[65] World Bank. (2010), *Innovation Policy: A Guide for Developing Countries,* World Bank, Washington, D.C.

[66] Wortzel, L.H., Wortzel, H.V. (1981), "Export market strategies for NIC and LDC-based firms", *Columbia Journal of World Business,* Spring, 51-60.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)