

TECHNOLOGY INSTITUTIONS IN SMALL PRODUCERS' CLUSTERS: CASE STUDIES OF CRAFT VILLAGES IN NORTHERN VIETNAM

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Abstract:

Technology and innovation have been recognized as important and crucial to reducing poverty, generating wealth and bringing social progress for Vietnam. But the result is different in different sectors. Craft villages are composed mostly of small and micro household business characterized by family ownership and heavy involvement of the family members. Many clusters have achieved great success thank to applying innovation in production and business. What enabled small producers to introduce new technology into innovation process? How has new technology been developed, adapted and disseminated?

There could be an investigation of innovation in informal micro and small enterprises with a view to offer alternatives. Actually, recent research shows changes in competitive capabilities, living conditions and the environment in informally organized craft villages. We propose to look at some examples of small-scale craft villages: Bat Trang and Duong Lieu in northern Vietnam. Both were identified as innovation industries based on the three common key elements: newness, value creation and innovative process.

Keywords: *Technology, Institution, Innovation, Innovative Process, Craft villages.*

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1. Introduction

There are now about two thousand craft villages that are composed mostly of small and micro household business characterized by family ownership and heavy involvement of the family members. Vietnam government has a policy of restoring and developing craft villages but focuses mainly on traditional and ancient cultural villages, promoting

potential tourist villages. Under pressure of competitiveness in the market economy, only sustainable craft villages have survived and prospered, relying solely on internal forces. Many clusters have achieved great success thank to process or product innovation carried out by small producers.

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enterprises with a view to offer alternatives. Actually, recent research shows changes in competitive capabilities, living conditions and the environment in informally organized craft villages. We propose to look at two examples of small-scale producer craft villages: Bat Trang and Duong Lieu in northern Vietnam in suburban areas in Hanoi. Both were identified as innovation industries based on the three common key elements: newness, value creation and innovative process.

Although the innovations are not typical in terms of technology development, investment in R&D, it is innovation just the same, creating a new or improved product for sale without changes in the production process or changes the way the product is made without changing the product itself. In the context that the Vietnam government has created technological policy related to innovation emphasizing R&D activities, it is unknown if small producers could take advantage of this opportunity to innovate their business. At first glance, there were no technology transfer projects or policies promoting the R&D within the small producers' clusters. Besides, some authors argued that if the institutional framework was lacking, technologies would never be utilized to their full potential (UNIDO 2002). This meant that closer examination of the problem was needed on our part. How has the introduction of new technology into the innovation process been made possible and how has technology been developed, adapted and disseminated in the two informally organized clusters in Northern Vietnam mentioned above.

Two research questions raised: What enabled small producers to introduce new technology into innovation process? And how has new

technology been developed, adapted and disseminated?

The paper is structured as follows: In the theoretical context, we review the literature about the introduction of technology in context of innovation and the innovation systems with its determinants. We adapted the approach of innovation system (IS) into the context of small producers clusters in northern Vietnam. To do this, we defined the conceptualization of the analytical framework to collect data. The two cases Bat Trang and Duong Lieu are described and interpreted. The paper concludes by highlighting the difference between innovation theory in western countries and the reality-based application in developing countries like Vietnam. It also proposes a future research agenda in this topic.

2. Literature review

Innovation is often discussed in terms of the introduction of technology. This paper will make reference to Kondratiev's ideas in this regard, which were taken up by Joseph Schumpeter in the 1930s. These lie at the heart of trends in development. They explain the correlation between basic innovation technological revolutions and economic development periods.

Technology

It is notorious that technology was significant both in terms of input and output of innovation processes. Over time, technology has been developed formally in radical innovation and more informally in incremental innovation by production engineers, technicians and the shop floor (Freeman, 1995). The formal technology development is related strictly to research and development activities (R&D). It is defined as "creative work undertaken on a

systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications” (OECD, 2008).

From the latter part of the nineteenth century, R&D was conducted as in-house professionalized activities in the German chemical industry. Its success drew on the imitation of the R&D department in other industries in Europe and in United States of America. Freeman (1995) described the growth of professionalized R&D labs as a giant step forward that was reinforced after the second World War. Mowery (1980), and Hughes (1989) observed that specialized R&D labs characterized most large firms in the manufacturing industry but few small firms or services industry firms. R&D in OECD is often scientific or geared towards developing particular technologies and is frequently carried out as corporate or governmental activity. It mobilizes both government, industrial and academic engineers and scientists.

R&D has been seen as a decisive factor in radical innovation in addition to other lately-observed factors such as inter-firm relationships and external linkages within the professional science-technology systems (Gibbons and Johnston, 1974). R&D expenditure has often been a measure of the performance of economies in terms of technology progress. This is valid for industrialized countries such as Japan, USA and European countries. Regarding the developing countries, R&D as percentage of GNP has become more important as an indicator of technical capability. However only formal/governmental R&D and enterprise-level R&D in (TNCs and large

firms) has been taken into account. Data on the technology development related to incremental innovation has been omitted.

Institutions

Regarding the understanding and definitions of institutions, no universal definitions have been agreed upon. That is to say: the rules of the game where the players interact with each others to affect the innovation process. In this paper, we tend to distinguish institutions as rules of the games from other organizations/players/actors that are seen as institutions by only some authors. The possible actors National Innovation System (NIS) are the small entrepreneurs (innovators), the Association of handicraft, but also universities, research institutes, investment banks, schools, government ministries. These actors coordinate and interplay in an institutional context, which implies the importance of the innovations systems paradigm (Edquist 1997).

Many definitions of institutions have bewildered researchers in spite of their focal point in the NIS. Many typologies do exist, proposed by innovation research authors: economic institutions - political institutions, formal – informal institutions, basic – supporting institutions, hard and soft institutions (B. Johnson, 1997). In addition, some authors classified them as regulative, normative and cultural-cognitive institutions (Scott, 2001) or behavioral, cognitive, associative, regulative, constitutive institutions (Parto, 2001).

North (1990, 1991) defines an institution as the humanly devised constraints that shape human interaction. They consist of both informal constraints (norms of behavior, conventions, self-imposed codes of conduct) and formal

constraints (e.g. rules. Laws, constitutions) and their enforcement properties. Formal institutions are enforced by a coercive third party whereas informal institutions are self-enforcing. Parto, as regards this distinction, (2005b) classified in detail the increasing range from informal/social to formal/societal level: 1) Behavioral institutions defined as standardized (recognizable) social habits that manifest in activities of individuals and groups as reflections of social norms; 2) Cognitive institutions defined as mental models and constructs or definitions based on values and embedded in culture; 3) Associative institutions defined as mechanisms facilitating prescribed or privileged interaction among different private and public interests; 4) Regulative institutions defined as prescriptions and proscriptions; 5) Constitutive institutions defined as setting the bounds of social relations. The differentiation blurs the national, regional, sectorial boundaries of an innovation system, involving the endogenous and exogenous institutions. This typology of formal and informal institutions is not defined in terms of organizations that constitute the institutions. The implication is that the more formal institutions are the more organizations/actors are identified.

To the extent that a major concern of many researchers is about only formal institutions while the informal ones are often ignored, the findings of some authors are significant for further research. This concerns developing countries where the formal institutions are so weak. Informal institutions may be understood as the collection of social norms, conventions and moral values that constrain individuals and organizations in pursuit of their goals (Pejovich, 2006). In such a poor institutional

context in the cases of small producers' clusters in Vietnam, the informal and informal institution typology would be relevant for the analysis. This is true where the formal rules put less focus on innovation in poor clusters while the research is missing the informal institutions. Institutions in the research, which are "the rules of the game" are distinguished from organizations as the players.

Application of the concept of technology institutions to developing countries

There is currently a lively debate about the role of institutions in improving the economic productivity and progress of countries. These aspects are central in innovation theories, mostly in western economies. The researchers of various lines have used the institution to explain the economic development. In fact, since the study of innovations has emerged again over the last 20 years, the promotion of innovation by reinforcing institutional context has been increasingly crucial to policies and programs formulated by most western countries. Entrepreneurial programs to initiate new company formations and technology development programs have been launched. The attention of governments in western countries has spread to developing countries. However, there has been concern that the programs or policies focus mainly on the companies, the industrial zones and on high technology. The institutions related to informal organized economic entities such as households or craft villages and to small-scale technological improvement by small producers have been neglected.

Despite the recent prominence of institutions, the matter is still controversial. There is the question how an institution is defined, and how

it operates to impact economic development, societal changes and the living environment. Particularly, in recent years, there has been a renewed interest in using institutions to explain innovation in developing countries. However, on the one hand the vagueness of definitions has bewildered researchers, unable to apply it to the unstable institutional context. On the other hand, the impact of institutions on economic performance has put focus on enforcement issues and put into doubt the administrative quality of the public sector (Thi Bich Tran, et al., 2009).

3. Research design and Methodology

Going on from the theoretical background, a focus on institutions seems the way forward to understand what enabled small producers to introduce new technology in the Vietnamese cases. Using the theories related to institutions that unlock the secret of successful innovation process in western countries, we will carry out an institutional analysis to reveal what enabled small producers to introduce technological innovations. Institutions are described as follows: formal and informal institutions (norms of behavior, conventions, self-imposed codes of conduct, agreements, contracts, regulations, laws, constitutions...) interacting the human behavior by providing information, managing conflict and increasing cooperation; channeling resources to innovative activities, facilitating learning and providing incentives in the process of choosing, piloting, applying and disseminating technology within the networks of actors (small producers, outsiders such as universities, technology providers, ministries, etc.) We start by using institutional analysis to explore how formal and informal institutions behave and function in terms of introduction of technology into innovation

process. In order to identify institutions, we choose the functional approach by collecting data about the functions.

There have been many types of institutional analysis developed in the past decades. Some authors such as Edquist (2005), Galli and Teubal (1997) used to experiment with the approach to institutions by exploring what institutions do (functions). Since institutions both constrain and enable innovation, the authors analyzed mainly positive functions within the NIS such as bringing forward innovation or creating new knowledge. Characteristically, the rules and constraints nature, institutions are defined by Elinor Ostrom (1986) as “prescriptions, commonly known and used by a set of participants to order repetitive, interdependent relationships. Prescriptions refer to which actions are required, prohibited or permitted.” The function is to govern the relations among individuals and groups. Similarly, Edquist and B. Johnson (1997) confirm that innovation is an interactive learning process and institutions precisely perform the functions that structure and regulate human interaction in this process. Functions are the “actual activities” within the innovation system that influence the development, diffusion and implementation of technology. These establish the link with R&D efforts. The neo-institutionalisms who mainly confine issues to transaction costs put the emphasis on two dominant roles attributed to institutions: i) to parameterize the environmental state variables (comparative costs of market, hierarchies), ii) to constrain the menu of actions available to the agents (Coriat and Dosi, 1998).

For our purpose we cannot apply the above-mentioned institutional analysis and the NIS as a standard. The reason is that they focus

too much on formal institutions. Our starting point for the analysis in the context of a developing country is an investigation into the key functions of institutions that form and facilitate the dynamics of innovation. These are distinguished by Edquist and B. Johnson (1997), Freeman (1995), Freeman and Soete (2007). They contribute to the overall function of institutions defined similarly by many authors. We have identified the following functions which we will use as bases for our analytical framework.

i) To reduce uncertainty and instability by providing information

Institutions provide information to deal with uncertainty that applies to innovation activities (technological service systems, patent laws, intellectual property rights, norms for credit repayment, honesty and trust). Therefore rules, practices, stable relationships are needed to provide information. Institutions help individuals to reduce overload of information as well as inform them.

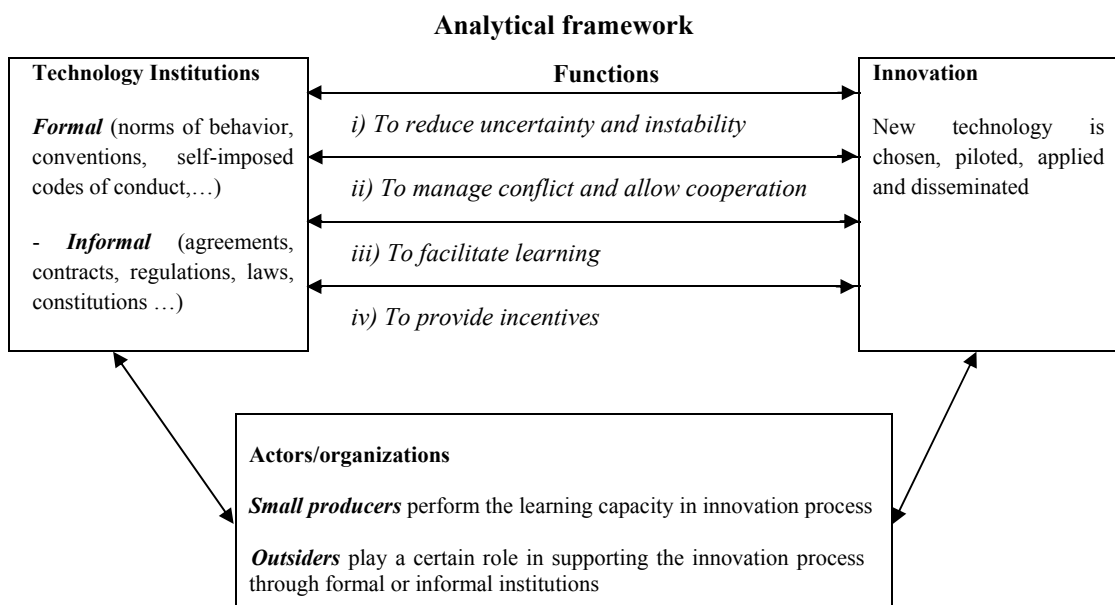
Analytical framework

ii) To manage conflict and allow cooperation

Institutions are regulated power relations and facilitate behavior in recurrent interaction. Conflict has the potential to be a serious problem in connection with innovation activities. Innovation may be accompanied by reshuffling of power, prestige and income; this burdens people with costs of change. An institutional set-up that effectively redistributes the costs of change and compensates the victims also supports innovation.

iii) To channel resources to innovative activities/To facilitate learning

Institutions channel and structure information flows, knowledge generation, collective learning and processes of interactive learning. They take the shapes of education and training systems and are carriers of tacit and codified knowledge. Learning processes and competitive specialization co-evolve in a process where institutions have an influence in structuring the interaction process.



iv) To provide incentives

Institutions specify and implement the sticks and carrots of economic life. An incentive is any factor (financial or non-financial) that enables or motivates a particular course of action, or a reason for preferring one choice to the alternatives. Institutions generate incentives that steer the behavior of agents in one way or another.

The four functions are not definitely all at the same time attributed to each type of institutions, but they are necessary to identify the formal and informal institutions implicitly or explicitly in the innovation system. In contrast, it would be good to explore the often ignored function of institutions when investigating the continuous interaction of institutions, organizations, and entrepreneurs.

Data and sample

Fieldwork

We aimed to derive results from the formal and informal institutions giving the small producers trust, information, predictions and stability in the process of innovation (initiation/idea, implementation/testing, dissemination/commercialization). We chose two small producer's clusters, Bat Trang and Duong Lieu in Hanoi in northern Vietnam for an experiment in inductive exploration.

The two selected cases have been researched for several years in a series of studies by IVO and have some characteristics in common in term of geographical location, demographic composition, work force involved in the craftwork, accessibility and similar policy/government contexts. Both are craft villages informally organized as small producers' clusters where the small producers are the innovators. However, the cases differ from

each other in the sense that they produce different types of products, having different histories of innovation and different types of innovation. We explored to what extent they are similar in term of new technology. The differences and the similarities of these cases will provide the material for comparison.

We focused on initiative period, implementation, dissemination and current development of cases as a flow magnitude. Hence the cases were depicted as a history of introduction of new technology into innovation process. The data were collected during 2 fieldwork trips in May 2013 and in February 2014.

4. Case study Analysis

a. Process innovation in Bat Trang ceramic village.

Bat Trang is a traditional handicraft manufacturing village with a long history of pottery production. It is situated about 20 km from the central business area of Hanoi in the southeast suburbs of Hanoi on the Red River bank. Bat Trang ceramics have been shipped to many countries, such as Japan, the Republic of Korea, the US and EU member countries. It has a population of about 7761. In the village more than 1200 out of 1720 households produce pottery and the rest are engaged in trading and services (The People's committee of Bat Trang report, 2010). Most pottery producers are household level micro entrepreneurs, in addition to 60 small and medium enterprises belonging to private companies, cooperatives and state-run companies. During the past decade, most of kilns in Bat Trang have changed to gas fuelling instead of charcoal, thus helping to reduce environmental pollution and ensuring

the quality of products. This made Bat Trang change in terms of economic prospects, as well as social and environmental ones. Now 100% of enterprises in Bat Trang and 90% of pottery households use LPG kilns.

(i) Initiative period

When Bat Trang fell into crisis at the end of the 1990s, traditional small producers were confused about overcoming difficulties. Meanwhile the neighboring Chinese ceramic producers were occupying the market because of their cheap, highly qualified products. At that time, the GTZ fund of Germany organized a conference in 1997 on LPG (liquefied petroleum gas) oven technology with support from local administration in Bat Trang. In doing so, they introduced for the first time the idea of new ceramic production technology already in application around the world. In addition, some proactive groups took part in international market fairs and visited the enterprises using LPG kilns in Bat Trang to learn about the domestic competitors. This was the case in Hai Duong province and some provinces in the South and also in China. Besides the economic gains of a gas oven, environmental advantages were recognized by small producers. As a result, some pioneers began switching from charcoal kilns to LPG ovens. This was the case for ceramics enterprises in the South and in China.

(ii) Implementation (adaptation)

The first gas kiln imported from Japan at the price of VND 250-300 million, equivalent to USD 20-25 thousand (rate of exchange at that time) was introduced into ceramics production in Bat Trang in 1997 (by ATEXPO company). It tested the idea of replacing the traditional charcoal kilns. Other producers followed: Quang Vinh

Company bought gas kilns from Taiwan and South Korea. In 1998, they introduced the gas oven manufactured in Thailand with German technology. The German expert transferred the installation of LPG to producers in Bat Trang, which led them to learn about the technology. In 2000, a company (HAMICO) decided to buy one 8 m² LPG kiln made by South Korea at the price of 43.000 USD after ongoing exploration and consideration in market fairs. But the new gas oven didn't give the expected results because of low volume of successful products, excessive baking time, high energy expenditure and especially it was too expensive and out of reach of most of small producers.

During the first trials, some small producers who used to be technicians working for the State owned enterprise in the 1980s switched over. Mechanics in Bat Trang learnt about the gas technology and could carry out minor repair work, such as was necessary to improve the kiln. Learning by themselves and accumulating experience, the small producers developed the gas oven with the help of experts from universities. They too were now able to produce the typical ceramics of Bat Trang. Gradually, oven builders emerged in Bat Trang who could install the LPG oven by themselves at much lower cost than before and could be called upon the anytime there was a break-down.

(iii) Dissemination

After the success of some pioneer entrepreneurs, others followed to switch from charcoal and wood-fired kilns to LPG ones made in Bat Trang. The information came from relatives, neighbors, other members of Association of Ceramics in Bat Trang and many made the discovery by themselves

when they were employed by the LPG kilned producers as workers. The switching process has been met with no resistance thanks to the financial capacity of small producers as well as the continuous improvement of LPG ovens. Small producers worked alongside kiln builders to learn about the technology, to accumulate experience and risk new capital .

In 2006, when the innovation process was bringing about positive changes in terms of economic as well as environmental development, Bat Trang got involved in the Project ESCME: (*Vietnam Promoting Energy Conservation in Small and Medium Scale Enterprises*). This was co-organized by Global Environmental Fund (GEF) as a sponsor, UNDP as a manager and Ministry of Science and Technology (MOST) as an implementer in the period of 2006-2011. Some small producers became the beneficiaries of the financial support (39 kilns from GEF and 6 kilns from the Embassy of Czech). In comparison, a few producers in Bat Trang (about 350 gas ovens) became self-supportive. In the framework of the project PESME, the local Administration and the Association of Ceramics supported small producers in organizing related activities. These included presentation of the gas oven model, training courses, conferences etc. which contributed to the promotion of producers switching from coal fired ovens to gas fired ovens.

(iv) Current development

During the past decade, most producers (100% of enterprises in Bat Trang and more than 90% of households) in Bat Trang have changed to LPG kilns. The use of gas fuel is observed as highly beneficial in terms of time saving and improved quality of products.

To complete one batch in a traditional kiln requires 3-4 days (including loading time) while a batch in a gas fired kiln requires less than 20 hours. The percentage of good pieces per batch is only 70% in a coal-fired kiln where as the success rate for gas-fired kilns is 90%. The quality of the products from gas kilns is also superior because the temperature can be controlled evenly. The producers observed that environmental damage is also significantly reduced, as burning gas emits a fraction of the carbon dioxide (CO₂) of wood or coal, thereby improving people's health in the community.

As a matter of fact, Bat Trang is considered to be a successful innovative cluster, the innovation process being a continual one. Experts introduced the new technology, and improved it to adapt to their production conditions then continued to think about possible improvements of LPG kiln and even about cleaner technology. The first electric tunnel was tested successfully with the support of technicians from the University of Science and Technology and taken into consideration for application in mass production.

b. Product Innovation in Duong Lieu cassava starch and noodle-producing village.

Duong Lieu village, located 25 km from Hanoi center, approved as a traditional agro-processing village by government in 2001, has been producing cassava and canna starch and noodles since the 1960s. The economy of the village expanded since 1980s, resulted in a big change in the living standards and the degradation of the environment. At present there are about 2.600 to 3.000 households and about 35 companies involved in food processing. More than one decade ago, small

producers started to diversify the products from cassava and canna. Medicine pills, soft drinks, cardboard boxes and candy contributed to a success story which helped small producers generate a better and more stable income than from noodles or starch production. Duong Lieu is a classic case of product innovation but behind the success of small producers of candy and soft drink, we find the role of technology in innovation process.

(i) Initiative period

From 1960-1980s, the cassava and canna processing technology was very simple, using only hand tools and leg tools with very low productivity. After the Renovation Policy promulgation in 1986, milling machines using gasoline were introduced into production. In 1996, the introduction of electric machines raised the productivity to 1,500-2,500 kg per working day. Before 2003, small producers used stirring machines to process the cassava roots after grinding them. But then they had introduced a combinative machine integrating the functions of cleaning, grinding and stirring. These machines have been developed appropriately and efficiently by the small producers and local processing machine manufacturers.

Thanks to the proximity of and access to Hanoi's growing markets, and improved traffic to other regions in the country, small producers were promptly informed and responded to market needs by investing in the candy production line in the 2000s.

(ii) Implementation (adaptation)

Candy production was added into the value chain in Duong Lieu: this included cassava and canna starch processing, starch filtering, maltose production, candy production. Some early candy producers bought the simple

production line from China and the South of Vietnam or the old machines of candy factories. The candy made by Duong Lieu was supplied to Hanoi market and far away provinces and candy producers gained much from this newly emerging industry.

(iii) Dissemination

Witnessing the success of candy producers, some neighboring producers followed suit to purchase the new production lines that were manufactured by local machine producers at cheaper cost. The Vietnamese mechanics were prompt to develop their own machines, adequate for local production conditions. The material input is abundant in Duong Lieu and the candy production created new markets for starch processors.

(iv) Current developments

In Duong Lieu, the number of households that got involved in the candy production is not high but they play a considerable role in changing the economy of the cluster. The switching from starch processing to candy production decreased major pollution and added more value to starch activities in Duong Lieu. However, except for some enterprises that have a brand name and have sustainable strategies, candy producers are falling in a spiral trap due to continual and competitive reduction costs that have led to low quality products. Some candy producers are changing the products into soft drinks or packaging that requires new investment.

5. Case discussions

In exploring the investment incentive factors in cluster cases in northern Vietnam, we applied the institutions concept in innovation system theory to find out about the dynamics

involved. The results showed how technology in innovation process changed the industry in Bat Trang and Duong Lieu. The stories of how new technology was introduced into production and changed the economic, social and environmental climate were revealing. They differed significantly from descriptions in western theory.

Formal and informal institutions

First, there were moderately formal institutions such as legal establishments, government funding programs, universities linkages involved in the innovation process. These provided trust, information, stability for the small producers. To support the innovation process that was well embedded, the formal institutions can only be found in Bat Trang implementing some follow-up actions which are far considered as parts of policy tools. Although the project PESME facilitated some small producers to switch from charcoal and wood-fired kilns to LPG ones by financial support, most of small producers were put out of the playing yard because of technical constraints and the difficult access to financial sources. When the innovative train has been already going on smoothly, the governmental support becomes fuzzy and less significant. Bat Trang case proved the relevance of Lundvall's statement that the government should withdraw and give more space for private initiative, playing role of shaping the growth dynamics in developing countries. However, this crucial role of government was neither found in Duong Lieu where the pollution is a serious problem, attracting many researchers on clean technology. No viable supporting programs were given by government or local administration and solutions were elusive.

Without the innovation system as described in western theory, there are obviously none of linkages across organizations in term of technology transfer or R&D relationships. So, the missing bridge between technology organizations such as universities, research centers, Ministry of Science and Technology and small producers brought about the limited translation of the academic research into the technological application. In Bat Trang, small producers and experts from universities shook hands with each others to improve LPG kilns, but the partnership in R&D activities was usually individually and informally set up. The same cooperative method was found in Duong Lieu case.

While there was hardly any innovation law or regulation promulgated by the government as the formal institutions supporting the innovation, the informal institutions mattered amongst the most important. The way in which the institutions influence the behavior of innovators are found through the community living tradition, the inter-generation production custom promoting the strong personal commitment for innovation and making them confident in the decision of investing in new technology. Living within the community for ages, small producers in traditional craft villages in Vietnam attributed an importance on the prestige of family tradition and traditional craft.

In most of craft villages in Vietnam, they founded the Association of profession that is a non-profit organization, spontaneous, social and occupational organization of traditional crafts villages, of enterprises, of economic and cultural organizations, researchers, training agencies etc. in order to preserve, restore and development crafts villages. It is aimed

at helping Craft villages and local handicraft producers to promote export strategies and strengthen its capacity as the focus for trade development worldwide. However, in fact, this task of supporting institutions depends much in each villages and the local administration and the privilege of government. Although in Bat Trang the Association of Ceramics operates based on willingness of small producers, it created the informal forum that contributed to introduce LPG oven technology. Established in 2002, the Association represents interest of ceramic producers regarding market, technology, design with the overall view to raise competitiveness of the cluster. Virtually all small producers in Bat Trang are member of the association. Since its establishment, Bat Trang Ceramics Association has boosted actively production, marketing and diffusion of gas oven. The association helps Bat Trang people and ceramics businesses get information about the market, learn about new technology, trading ways and opportunities for their trade in order to raise their competitiveness. The Association is operated like a club where the Association management board including 20 directors of ceramics producers play the proactive role. Although they keep their tricks of the trade, they create the common institutions for the development as they mentioned that the active participation of members of management board comes from the passion to long traditional job, their own profit and the reputation. The Association organizes events, market fairs, meeting and conferences of ceramics producers. It arranges also the delegations to visit the ceramics workshops in China, invites experts to Bat Trang to teach workers to use gas kiln. In contrary to Bat Trang, the Association in

Duong Lieu is not able to create a common forum for small producers.

Functions of formal and informal Institutions

i) To reduce uncertainty and instability by providing information

The information provided by the third party is always important, particularly the providers are experts, gaining no profit in this business. The conference of GTZ fund triggered off the introduction of new technology.

Although small producers didn't tell the success secret to others, the custom of living open-mindedly within the community amongst relatives, friendly neighbors established forum within the village and in the Association (in Bat Trang) where they got information and observed implicitly the steps of early innovators until they felt confident enough to decide to invest in the new technology. Like the situation of abundant similar products in Bat Trang and Duong Lieu, it is considered as normal and acceptable that the improvement of technology become the common property of all producers when small producers learnt by doing, owning totally the technology. The information was provided easily and spontaneously consolidated the decision of followers.

Small producers and experts from HUST underwent the informal cooperation that experts played the role of solving the specific problems during the improvement of gas oven. They supported small producers with theory, technical analysis and offered advices in the writing manual of training workers. The owners of innovation process are the pottery producers. They learn, improve and do their own technology by themselves. However,

the technological organizations contributed significantly to the adaptation of new technology to the whole cluster because their presence convinced the hesitating producers.

ii) To manage conflict and allow cooperation

The innovation in Duong Lieu on one hand prospered the whole clusters, but in another hand polluted the air, the water resources, leading to diseases. Although the local Administration was incapable to solve thoroughly the environmental pollution that influenced not only the producers but also the none-producers, they issued the environmental protection regulations in 2000 which specified the responsibilities of processing households and local stakeholders (the People's Committee, women's union, youth union, ...) in an attempt to control the degradation of pollution. The cassava processors had to pay an extra amount of money for their polluting environment. In parallel with the issuance of regulations, the local Administration cooperated with unions to disseminate environmental protection information to the villagers, which contributed to pollution mitigation measures that seemed inefficient for such a seriously polluted village. All the producers damaged less or more the environment. So these activities were not to redistribute the costs of change and compensate the victims but subdued the conflict. Similarly in Bat Trang, Association and Unions are not formal organizations but their activities put impact effectively on the harmony of village through meetings in community or in Association.

The neighborhood, closely relative relationships, living in community custom showed the effectiveness in coordinating

the interaction amongst small producers and other stakeholders. The followers could adopt quickly the gas technology or candy production line without any hindering from early innovators.

iii) To channel resources to innovative activities/To facilitate learning

Without the transfer technology services and supporting program of government, small producers had to be proactive and to perform actively indigenous absorptive capacity. They learnt by working every days with machinery, knowing the need to improve the technology to fit their production conditions and their own objectives. As stated by Lundvall (2009), the most important of all capabilities is capability to learn that is fundamental for all the other capabilities and shapes the dynamics of welfare.

The informal cooperation with experts from universities turned the workshops in clusters to R&D laboratories where the small producers, experts and their students interacted as colleagues. The small producers that were more experiential developed their competence based on the consultancies from lecturers. On the contrary, universities found more practical experiments within clusters. The learning capability was embedded in the informal cooperation mechanism between technological organizations and small producers.

iv) To provide incentives

Although in Bat Trang many actors were involved in the innovation process, small producers took initiative by themselves in the initiation of the innovation, involving the organization of technology, investment capital and establishing contacts with new clients.

They chose the technology, invested and improved it at their own risk with consultancy from university experts. The new technology was disseminated spontaneously within the community without the technology transfer organizations. Even if some outsiders get involved in this process for instance the organizations from project PESME, they are still some credit institutions who play a modest role in multiplying the new technology users by providing financial sources.

v) To encourage in finding new practices, combinations, ... (new role of technology institutions)

Technology, which does need to be new invention but new technology for the village can raise the competitive advantages of clusters by turning them to innovation that however did not only concern technology. Although the large range of new products, new distribution systems were generated after the new technology setting-up, it's difficult to deny the contribution to the value created by innovation process.

Responsible innovation

Finally, with regard to responsible innovation, small producers need insights in environmental and societal consequences of innovation outcomes. The facts and figures of the environmental and societal impacts that were given by the third parties such as ministries, funds, NGOs, media oriented the choice of technology of small producers and accelerated the innovation process. Although the profit was always the first concern that the small producers took into account when deciding to invest to the new technology, how the technology improves or worsens the working place quality gave them driving force

for prompt decision since the sustainable development catches more attention of people. The more positive impacts on the health of their family are appreciated, the more motivated the later producers get to join in the innovation process. Then moreover, the positive environmental and societal impacts are used vice versa as proof convincing the involvement of banks, funds or relevant organizations in promoting the responsible innovation.

6. Conclusions and Implications

In the paper we discussed what enabled small producers to introduce new technology into innovation process and how new technology has been developed, adapted and disseminated in Bat Trang and Duong Lieu. From the cases we conclude that it exists the strong informal institutions immersing under the family tradition, the community living style promoting implicitly the small producers to contribute to the national economy. In the instable institutional contexts in Vietnam, the craft villages will find their own way to live. While on one hand, we accept the fact that the policy relative to innovation (formal institutions) set the goal too high for the developing countries such as Vietnam in term of priority for some fields, some big enterprises to catch up the development of the developed countries, on the other hand the policy makers should be aware of that Vietnam is lack of a full-blown system of innovation covering the formal and informal sections of economy both. The informally organized clusters such as craft villages who contribute to the national economy should get more benefit from national and regional innovation system including the relevant institutions.

Although the role of the state in shaping the growth dynamics by managing the efficient organizations, creating the institutions covering the activities of the actors of economy is crucial, it is impossible and unreasonable that the state impose the top-to-down technology and the path of application of technology to clusters. It coincides with the conclusion of Lundvall et al. (2009) on the need for government to withdraw and give more space for private initiative so that small producers can develop their own technology corresponding to the local production conditions. It's no matter what simple or complicated technology is, technology should be appropriate to each cluster.

Last but not least, the informal technology institutions that create the dynamics for development of clusters in Vietnam don't regulate the human behaviors only by providing information, managing conflict and allowing cooperation, facilitating learning and providing incentives in the process of choosing, piloting, applying and disseminating technology, but also encourage actors to take further initiatives in terms of products, marketing, ... innovation. It's necessary to carry on further research on informal technology institutions and their potential functions toward the innovation process. □

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