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Understanding Responsible Innovation in Small Producers' Clusters in Vietnam through Actor Network Theory (ANT)

Jaap Voeten¹, Job de Haan, Gerard de Groot, and Nigel Roome

Abstract

Innovation is increasingly recognised as an alternative for poverty alleviation in developing countries. However, cases of innovation in small producers' clusters in Vietnam imply negative externalities that conflict with today's notions of sustainable and inclusive development. This article analyses how small producers innovate while taking environmental and social considerations into account through an interactive societal process towards a community network, conceptualised as responsible innovation. Existing multi-faceted theoretical insights do not provide sufficient basis to construct and test explanations. We apply a grounded theory involving Actor-Network Theory (ANT) to seek explanations as to why some small producers behave opportunistically while others acknowledge responsibility for the negative externalities. ANT enables us to see the critical details of the network creation process including the agenda of the key actors, push and pull factors, the type of innovation and the informal institutional context.

Keywords: innovation, inclusive development, clusters, conflict, Actor-Network Theory, Vietnam

Introduction

Earlier research describes cases of innovation in poor small producers' clusters in rural northern Vietnam (Voeten *et al.*, 2011). Household-based producers in traditional craft villages introduced new technologies and products, which contributed to the economic development of the communities. Although current innovation theories tend to focus on advanced technologies in formalised Western economies, the new economic dynamics in the Vietnamese cases meet generic criteria for innovation, commonly understood as

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the process of introducing new products, new processes, new business practices and so forth that create value (Nelson and Winter, 1977; Kline and Rosenberg, 1986).

However, the innovation examples in Vietnam not only created economic benefits, the communities also experienced a range of additional environmental and social consequences such as pollution, an uneven distribution of value created, a worsening of labour conditions and an emerging gap between rich and poor. These outcomes suggest that any analysis of innovation should go beyond a narrow economic focus on value creation and income and look at the broader innovation externalities, such as whether they are in line with the principles and conditions of sustainable and inclusive development (World Bank, 2000; George *et al.*, 2012).

In our further explorations into the behaviour, perceptions, conflict and human interactions, we found that in some of the Vietnamese examples, the innovators recognised responsibility in addressing negative externalities. The responsibility in this informally organised small producers' context emerged from dynamic, responsive and uncoordinated interactions within these communities. Drawing from a range of theoretical references, we conceptualised 'responsible innovation' as a dynamic societal process in which innovators acknowledge responsibility in the resolution of societal conflicts resulting from negative innovation externalities. This conceptualisation is modelled as a dynamic five-stage process in Annex 1 (Voeten *et al.*, 2012). While initially negative externalities may not be signalled or considered acceptable, these may lead to conflicts later on once these impacts become clear. Likewise, the behaviour of innovators may change over time from an opportunistic attitude towards a more open-minded one that acknowledges responsibility for negative externalities. Consequently, a community may be at one point in time in the so-called 'responsible innovation zone' but may then move out of it later on when material consequences emerge.

In an ideal situation, an innovative small producers' cluster creates value while moving into the responsible innovation zone by acknowledging responsibility for any (unforeseen) innovation externalities. However, often it does not, as illustrated by the many cases in Vietnam where innovators behave opportunistically, leading to societal problems and conflicts within their community. Small producers in

the cluster context thus based their innovation process decisions on economic motives as well as on responses from the proximate community members concerning negative environmental externalities. This contrasts with mainstream innovation literature, which mainly considers economic motives at the firm level. Although innovation research in advanced economies increasingly involve broader disciplines in analysing emerging societal challenges of economic activity, as reflected in the literature on Corporate Social Responsibility (CSR) and sustainable business (Frederick, 1960, Hart, 2007), insights into how innovation processes are steered by spontaneous societal interactions in poor and informally organised cluster contexts in developing countries are hardly addressed in the scholarly literature. This gap led us to our research question: how do small producers, as innovators working in a cluster, innovate and generate economic benefits while acknowledging responsibility for negative environmental and social outcomes? Our conceptualisation of responsible innovation involved various theoretical references that we first revisit for further clues and leads with regard to the research question.

Theoretical explorations

Scholars have written extensively about the stages of the innovation process and the diffusion of innovation (Rogers, 1962; Nelson and Winter, 1977; Dosi, 1988). Innovation was initially viewed as a one-dimensional ‘linear process’ of technology development that occurs at the level of the firm: proceeding sequentially from research through development to marketing. The evolutionary economic perspective, advanced by Nelson and Winter (1982) proposes a non-linear systems model, in which the institutional context plays a key role in facilitating and enabling entrepreneurs to take decisions based on economic motives in the innovation process. What this context exactly concerned and whether it included broader societal concerns, such as environmental externalities, was not explicitly addressed.

In the early 1990s, Lundvall (1992) and Freeman (1995) advanced the Innovation Systems theory. This theory suggests that the innovation process is characterised by interactive learning among the system actors: a spatial concentration of firms and associated non-market institutions such as universities, research institutes and relevant government agencies (Edquist, 1997). The theory describes the set of institutions that influence the behaviour of innovators. Acknowledging responsibility for possible externalities and the

dynamics of the human interaction is not addressed in Innovation Systems theory. Moreover, the theory assumes that static formal institutions fulfil the key functions in providing information, stability and predictability. Institutions – defined as the rules of the game (North, 1990) – mediate economic and social behaviour in changing realities of economic agents, including risk taking and social engagement preventing opportunism. Opportunism is an economic behaviour characterised by selfishly taking advantage of circumstances with little regard for principles or the welfare of others (Williamson, 1986). Our earlier explorations of the Vietnamese clusters of small producers showed an absence of such formal institutions. For these small producers, informal institutions - family ties, information exchanges and contacts - were much more important in developing solidarity and social engagement.

Recently, Lundvall *et al.* (2009) revisited the innovation system concept in the context of developing countries and this led them to acknowledge that the narrow ‘formal institution-focused’ understanding of the innovation system is of limited value for understanding innovation. He suggested that an approach based on Doing, Using and Interacting (DUI) involving informal learning, human interactions, tacit and local knowledge is more useful for building a broader understanding of innovation systems in developing countries (*ibid*). This reflects a gradually growing explicit recognition of the importance of informal institutional mechanisms, as witnessed in small producers’ clusters in Vietnam, in innovation theory. Informal institutions are further described in sociology, particularly their role in structuring human interactions in non-Western settings.

Spatial concentration of economic activity is also a common element in the broadly evolving industrial clusters theory. The original theoretical model discussed lower transaction costs related to distance and the implication of positive externalities within a certain geographical space (Marshall, 1925). Krugman (1991) focuses on the local pool of specialised labour, the increased local provision of non-traded input specific to an industry and the maximum flow of information and ideas that provide economies of scale. Porter (1990) characterised a cluster by sets of vertical and horizontal relationships among firms within a geographical location facilitating trading links, patterns of sales and purchases (McCann 1995). Granovetter (1992) advanced the ‘social network’ model, which rejects the rational response assumption to the transactions-costs issue. The social network assumes some strong interpersonal relationships involving changing

behaviour, attitudes and perceptions, which are essential in our societal process model of responsible innovation.

Learning-action network theory, related to the social network concept, partly helps explain the responsible innovation societal process model. Clarke and Roome (1995) have written about the sets of learning relationships that span business organisations and other stakeholders in society. The learning dimension, in particular, is a key element in the dynamics of innovation (Mytelka and Smith, 2001). There is also an extensive literature on learning organisations and learning regions (Rutten and Boekema, 2007).

Experiential learning, the process of making meaning ‘through the transformation of direct experience’, is particularly relevant in more informal settings (Kolb, 1984). The same applies for social learning through which actors can jointly begin to see different aspects of societal problems, constructively explore their differences and search for solutions that go beyond their own limited vision (Beers *et al.*, 2010).

Learning-action network theory also applies well to Vietnamese innovation clusters since it explicitly recognizes the network dimensions. Networks are seen as essential mechanisms for the development of knowledge and learning which, in turn, lead to innovation and adaptation (Granovetter, 1992;). Networks create social capital for individuals (Bourdieu, 1985) and communities (Putnam, 2000). As a research tool, network theory brings order to an apparently disordered world, reducing complex problems to a series of relationships.

Related to clusters and networks is the value chain theory, increasingly relevant in innovation and globalisation debates. Gereffi and Korzeniewicz (1994) distinguished various types of supplier-driven and buyer-driven global value chains. In these types of chains, different governance structures emerge, which Gereffi *et al.* (2005) describe as ranging from high to low levels of explicit coordination and power asymmetry. The governance structure impacts how economic benefits are distributed and steers responsible and opportunistic behaviour of value chain actors.

A last notable issue in our conceptualisation of responsible innovation is the role of materiality. The material outcomes of innovation in Vietnam resulted in emerging conflict steering the dynamics and

human interactions of the societal process. This suggests an epistemological tension: analysing human interaction involves adopting a constructivist, post-modernism approach which considers mental constructs, perceptions and negotiable representations of reality (Dessler 1999). If one acknowledges the role of materiality in the process, this involves adopting a positivist approach, which is premised on the existence of a single material reality and of one objectifiable truth (Devitt, 1997). In one way or another, this dichotomy should be included in the analysis of how materiality and impact interact with the act of acknowledging responsibility.

The theoretical explorations provide a varied multi-faceted picture of various relevant elements, concepts and notions in the socio-economic fields of innovation process, institutional context, behaviour, materiality and learning networks. However, the clues are fragmented and widely situated, which hampers the construction of consistent explanations of why one small producers' cluster ends up in the responsible innovation zone while another does not. An analytical framework developed from existing theory involving a deductive and reductionist approach or one single discipline therefore will not work if one aims to do justice to the multi-disciplinary nature of the societal process of responsible innovation.

Methodological approach

Instead we applied an inductive and qualitative research approach with a view to developing ideas to explain responsible innovation. In the next sections, we explore empirical material and observations, which we iteratively combine with theoretical insights, also known as Grounded Theory (Glaser and Strauss, 1967). We compare two contrasting cases, one classified as responsible innovation and another not. We consider this as the 'dependent variable'. We are particularly interested to identify internal factors and conditions as 'independent variables'. This concerns the internal characteristics of the clusters, the evolution of the roles, identities and interactions of the actors, the types of activities, type of innovation and the power structure, to name but a few. In order to assure the validity and reliability of the analysis, we compare two villages with similar 'control variables': external institutional, macro-economic, historical and political contexts.

The holistic nature of Grounded Theory implies some pre-defined focus in order to assure consistent data collection, organisation and structuring. In particular, a lens which enables us to analyse the dynamics of the societal process within the small producers clusters, and captures the array of critical theoretical clues. We opted for Actor-Network Theory (ANT), which Law (1992) describes as a methodological approach to analyse how networks emerge and the interactions among the actors involved.

Indeed, French ANT founders Callon (1986) and Latour (1987) emphasise that innovation in networks has to be studied in action, focusing on the dynamics rather than on the stability of the relationships. An ANT network is created when all the underlying human and non-human interactions are established, and there is a shared common understanding of the identity and role of each actor. This point is arrived at via a centred actors' group explicitly or implicitly claiming the central position in coordinating the process.

ANT sees innovation as the result of a dynamic formation of alliances in which materiality also plays a critical role: the principle of symmetry. For this reason human actors and material entities are jointly referred to as 'actants' in ANT terminology (Callon, 1986; Latour, 1987). Actor networks are based on, and framed by, objective non-human objects, material innovation outcomes, and technological artefacts along with the subjective perceptions and opinions of the actors involved; their attitudes, mental models, cultural patterns and so forth. From an epistemological point of view, ANT combines materiality as a positivist concept and human interaction perceptions and negotiations which represent constructivism by definition.

ANT gives rise to a new kind of geographical analysis, which is not bound to an absolute and fixed space. In particular, actor networks are constantly subject to changing contexts and conditions within geographical areas. New actants may be included while existing actants may be 'expelled'. Some actor networks remain in a certain geographical space, while other networks may further evolve outside the original bounded geographical area.

The ANT lens sees the process of network creation being achieved through four ‘translation moments’, configuring the actor-network (Callon, 1986; Law, 1992). The first moment is ‘problematization’, during which a group of actors claims a position as ‘centred actors’ and implicitly or explicitly defines a problem within an existing situation. This may be a network that falls apart, creating a chaotic situation, tension or confusion in a community or any other geographical bounded area. ‘Interessement’ is the second moment of translation. The centred actors seek to establish their central position by generating interest in relevant actors and actants. This includes the exploration of interests, roles, identities and definitions that are consistent with addressing the problematization. The third moment, ‘enrolment’, involves a process of convincing other actors – through a series of negotiations - to accept the definitions and identities of the human and non-human actants. This is the point at which they become aligned, or locked into place, in which the centred actors’ group seeks to impose their definitions of the situation on others. The ‘mobilisation of allies’ is the final moment of translation and consolidation, where all the actants are aligned and have their interests represented in the network. The enrolled human actants feel represented by the centred actors, conform to the terms of cooperation and agree that the network is worth building and defending.

Cases

The two contrasting cases are villages located in the rural Red River Delta in northern Vietnam. The villages are informally organised as small producers’ clusters where the producers themselves have introduced innovations. The first case describes Bat Trang, a traditional ceramics craft village. For centuries the villagers have produced porcelain and pottery items with traditional charcoal kilns for daily household use. In the 1990s, small producers started to introduce Liquefied Petrol Gas (LPG) technology for firing the baking kilns. Applying the innovation typology of Kaplinsky and Morris (2001)², we classified the introduction of this new technology as ‘process innovation’ (Voeten *et al.* 2011). The new technology has enabled the villagers to produce high quality ceramics and increase production volumes at lower costs. The second case discusses Van Phuc, which is a traditional silk craft village producing fabrics and tailored silk items and accessories. Silk producers started to open retail shops, taking over the

marketing function of other value chain actors. This is understood as ‘functional innovation’. In recent years, the shops have attracted many new clients and have increased production and sales, leading to increased prosperity in the village.

The cases are contrasting in terms of environmental and societal innovation consequences. Before the innovation in Bat Trang, the smoke emissions of the traditional charcoal kilns resulted in severe air pollution. The innovators included environmental concerns in their considerations to introduce LPG kilns, which resolved the air pollution to a great extent. We positioned this situation in the responsible innovation zone in the societal process model (Annex 1: stage 4 above the dotted line) (Voeten *et al.*, 2012). In Van Phuc, by contrast, the use of more toxic chemicals for the dyeing process to obtain modern colours resulted in severe water pollution in the village. The shop owners, as marketing innovators, did not acknowledge responsibility. In the societal process model, this situation is positioned in stage 4 below the responsible innovation dotted line.

Regarding the external context (‘control variables’), the villages have a similar demographic composition, work force, levels of accessibility and are situated close to the nation’s capital, Hanoi. They share the same macro-economic, political, institutional and historical context. Of particular significance are the economic reforms of 1986 by the Vietnamese government, implementing a complete set of new legislation aiming at promoting the private sector and allowing small enterprise, allowing and facilitating entrepreneurs to set up their own businesses and shops.

In the cases presented below, we provide a chronological historical description of the dynamics of the societal process of responsible innovation, structured according to the four ANT translation moments. We carried out fieldwork visits of two weeks each in May 2010 and February 2011. The team collected a broad array of qualitative material through observations and open, in-depth interviews with 20 - 30 innovative households per village, villagers, local officials, customers, suppliers and other informed people. We also conducted interviews in Hanoi with resource staff of research institutes, NGOs and government agencies.

Bat Trang ceramics village

Problematization

After the introduction of the economic reforms, it became evident for a group of small ceramics producers in Bat Trang that their products were of low quality compared to the newly imported products, from China amongst others. Moreover, the charcoal-fired kilns had resulted in serious environmental problems over the years: '15 years ago the streets were always filled with smoke and were black from storing the charcoal' (People's Committee administrator, interview May 2010). The rain washed away the black dust polluting the ground and surface water. The geographical and climate conditions made the situation worse; the smoke remained hanging in the village. Bat Trang had become one of the most polluted places in the Red River Delta and an increasing number of villagers suffered from respiratory diseases.

Concerned about the problems, which eventually would lead to the disappearance of the traditional craft, the group of small producers began to explore new ceramics baking technology. In ANT terms, a small group of ceramics producers conceptualised the 'problematization', which reflected both short and long-term societal considerations: increasing competitiveness while addressing environmental problems.

Interessement

The small group discovered the possibility of firing the kilns with Liquefied Petrol Gas (LPG). They approached the village authorities, local people's committee and the German Organisation for Technical Cooperation (GTZ) for assistance in their explorations into the new technology. Soon it became apparent that the new technology would enable the production of high-quality ceramics, which would be more energy efficient and much less polluting.

The small group of entrepreneurs purchased an LPG kiln from China and started the trials, with good results. Other villagers became enthusiastic about it, setting a process in motion whereby small

entrepreneurs began switching from charcoal to LPG fired kilns. The government initiated a project supporting the small producers in obtaining credit. The result was that between the mid-1990s and the early 2000s, two thirds of all the home-based enterprises installed an LPG kiln. Along the way, the producers contacted Hanoi University of Technology through informal channels for advice on technology.

The small producers keep initiative and ownership over the innovation process. The LPG idea of the early innovators, becoming the centred actors' group, generated the greatest interest of other potential actants. During this 'interessement' moment, they implicitly imposed new identities and roles around the production of the LPG kilns, including human actants - community members, government support agencies, GTZ, producers, suppliers, traders, transporters, customers and workers - as well as material actants – LPG kilns, locations, machinery, tools and products.

Enrolment

The LPG kiln was installed without major changes in the workshop set-up. As in the past, the home-based enterprises kept all the productions steps – modelling, shaping, baking, painting and glazing – under one roof. The LPG kilns implied an increased ceramics production and a shortage of labourers surfaced. Small producers had to recruit workers from outside the village. On the supply side, the ceramics producers contracted clay suppliers from other provinces, since the LPG technology required finer clay. Several local new kiln construction and maintenance companies established working relations with the LPG kiln owners.

On the buyers' side, the lion's share concerned large order contracts with Vietnamese wholesalers for domestic consumption contracts. Moreover, the small producers opened local ceramics retail shops. Hotels all over Vietnam contracted large orders and suggested design and colours (with hotel's logo printed in the glaze) accordingly. Hanoi tourist agencies started organised tours for Vietnamese and foreign tourists. Small producers also seized export opportunities. Initially simple one-time international export contracts were established via websites and overseas Vietnamese specialised in Asian shops in Japan, Europe, Australia and the USA. The higher quality at reasonable prices also attracted the attention of a broader

public in Vietnam. Tourist companies in Hanoi started to include Bat Trang ceramics craft village in their tour packages for foreign travellers. Although the ceramics attracted much interest, the domestic and overseas buyers have not expressed concern over the environmental and social issues.

There were several new relationships to be established in the ANT 'enrolment' moment: New contracts for orders, employment, transport and so forth had to be implicitly or explicitly negotiated and concluded with the human actants. These new relationships were built on existing traditions and customs such as honest business principles, trust, helping each other, solidarity and a common pride in high quality ceramics production. It was not difficult to agree the new contracts 'because this is how we do things and we trust each other' (Ceramics producer, interview February 2011). These existing traditions and customs, also labelled informal institutions, functioned as a reference framework for the ANT 'enrolment' moment. The home-based workshops are freely accessible; neighbours can walk in and out for advice and help. This provided a context where discussion took place about environmental issues, reminding and encouraging each other to acknowledge responsibility for cleaner production.

Mobilisation of allies

The LPG kiln was a success story in terms of improved competitiveness, implying less poverty and cleaner air in the village. The villagers had a feeling of pride, satisfaction and control over the craft and the fact that they initiated the LPG technology by themselves. There was solidarity among the small producers, they often shared large orders, but there was also some 'healthy' competition among the retail shops owned by the ceramics producers frequently visited by day trip tourists. Many villagers witnessed that, despite the new developments, the village's traditional norms and values and pride and solidarity among the people did not change.

Over time, the Ceramics Association united and institutionalised the interests of the centred actors of the network. The Ceramics Association organises technical information events and provides a platform to exchange information on technical issues, marketing and exports, social and environmental issues and investing in clean technology.

Emerging issues

In the 2000 – 2007 period, most villagers perceived Bat Trang as a pleasant place to live, taking advantage of the benefits from the innovation. However, since the global financial crisis in 2008, new challenges have surfaced, particularly in terms of productivity and competitiveness. Some small producers see that the LPG kiln is not used to its full potential. Other villages in Vietnam, and particularly in the surrounding area, are becoming more involved in ceramics, posing a competitive threat. The producers in the village have not really responded to the changing context; there is no new significant innovation, in terms of technology, product innovation or organisation of production. From the ANT perspective, the new challenges illustrate the dynamics of upcoming and disintegrating actor networks; after a period of relative stability, new challenges arise and human and material actants emerge, challenging the existing network.

Van Phuc

Problematization

In the 1970s, the Vietnamese government collectivised the traditional silk production in Van Phuc craft village and contracted villagers as labourers and craftsmen. This cooperative organised domestic marketing through internal governmental channels and export to socialist nations such as the Soviet Union and Eastern Europe. In the 1990s – following the economic reforms – the silk cooperative was dismantled, bringing economic freedom as well as uncertainty; the silk workers lost their fixed employment. They began to re-establish the silk production in home-based workshops. Some households specialised in weaving, others in dyeing, tailoring, sales or trading.

Taking up the old craft of weaving and dyeing within households was in line with their craftsmanship, but marketing through sales and trade of the silk products was a greater challenge. In terms of ANT, after the collectivised network of silk production fell apart, the marketing problem constituted the

‘problematisation’ addressed by a small group of producers who started to explore the possibility of establishing retail silk shops. They had a narrow agenda reflecting their immediate short-term interest: the loss of outlet channels due to the dissolution of the cooperative.

Interessement

The potential success of the retail outlets showed quickly after the first shops were opened. More silk producers began to follow. On the buyers’ side, day trip visitors from Vietnam increasingly came to the village to buy silk at reasonable prices. Foreign tourists started to visit the village in larger numbers. The silk shop owners began to place larger orders with the silk weavers, dye workshops owners, designers and tailors in the village. Some shop owners concluded tour arrangements with tourist companies in Hanoi that started to organise ‘craft village’ tours. Also new export opportunities were tapped and new working contracts were established with marketing agencies, agencies handling paperwork for export and local authorities issuing permits. The Van Phuc silk association also became more active, particularly to facilitate export responding to requests from Europe, Australia and the USA.

The village authorities considered the emerging commercial activities in the village as a good basis on which to pursue economic development in the village. They started to facilitate the procedures for trading and exporting and for establishing silk shops. They initiated promotion campaigns of Van Phuc as a premier silk craft village. Later they invested in the village infrastructure, such as upgrading the main street, reconstructing the traditional gate, pagoda and small parks.

In ANT ‘interessement’ terms, the shop owners became the centred group. Due to the success, the shop owners gained a dominant economic position, enabling them to explicitly and implicitly impose new identities and roles on the human actants – weavers, dyers, tailors, clients, village authorities - as well as material actants – shops, the looms, the silk products, and village infrastructure.

Enrolment

Retail sales through the silk shops implied a fundamental reorganisation of the production and marketing in the village. In fact a whole range of new agreements and contracts about the price, quality and delivery time were concluded. In particular, because the traditional silk fabric designs were still set by silk weavers. These negotiations for contracting proved to be harsh, difficult and time-consuming. There were no existing 'ways of working', examples, or standards that could be used as a reference framework for facilitating the contracting.

The shop owners introduced new silk tailored products with modern colours and patterns, so they had to agree with designers and tailors about designs for 'fashionable' products and colours. The old way of dyeing involved natural products, but the modern colours involved the use of new dyes for washing the silk that contained toxic chemicals. The shop owners' way of serving customers moved away from the traditional way of doing 'honest' business. They pretended to sell 100% silk products to ignorant tourists while in reality they were mixed with artificial nylon. Older silk producers started to get dissatisfied and complained about this practice.

In ANT terms, 'enrolment' involved a complicated process of establishing the contracts with the human and material actants. Since the shop owners – as centred actors – had the most economic power, they were able to impose 'contracts' on the other actants. The weavers, tailors and dye workshops had no choice but to join.

Mobilisation of allies

There was initial enthusiasm and hopes for a better future. However, the notion surfaced that the shop owners were making most of the money and questions were raised as to whether this was fair. Most households did not have the relevant experience to access markets beyond the village shops. In order to remain in business, they had to conform to the orders and instructions that came from the shop owners.

Moreover, dyeing processes involving toxic chemicals has led to serious environmental consequences. The dye workshops have discharged their toxic waste water into the sewage system, resulting in severe ground and surface water pollution. The owners of the dye workshops cannot easily change their practices and have little motivation to do so. Shop owners do not recognise their responsibility - although they require the dye workshops to use the new chemical dyestuffs – and appropriate the greatest value in the value chain.

In ANT terms, the silk shop actor network materialised, but ‘mobilisation of allies’ is problematic and does not create a strong network supported by many human actants. Most human actants do not feel represented by the shop-owners, nor by any other form of organisation.

Emerging issues

Many villagers perceive that the solidarity of times past has gone and people are more selfish. Since 2008 the market has been stagnating, and new competitors have set up business in other villages and in Hanoi. Shop owners have started to buy silk products for their shop from outside suppliers including China. People have an uneasy feeling that the village is falling apart due to the increasing pollution and the fact that the village has become a market place only and the silk production – and value creation – is evolving outside of its original geographical boundary. In ANT terms, the dominant actors were not motivated to resolve the consequences that occurred within their geographical setting. Rather, they started to look for opportunities to link up with others from outside the village.

Key differences

The societal processes around the notion of responsible innovation in Bat Trang and Van Phuc contain the key elements of ANT’s translation moments. Table 1 summarises the different key ANT elements identified between two cases.

Analysis and discussion

Responsible innovation actor network

The cases show contrasting ways in which the centred actors respond, interact and deal with the emerging issues and challenges. In Bat Trang, the innovators acknowledged the past pollution problems by investing in cleaner technology. In ANT terms, air pollution became a material actant; it has been addressed and allowed to enrol in the network. In Van Phuc, the shop owners - as centred actors - face emerging pollution. Instead of addressing it, they ignore the problem and do not acknowledge responsibility; the pollution is not allowed to enrol as a material network actant. The ANT insights complement the societal process model of responsible innovation (Annex 1) in the sense that the centred actors acknowledge responsibility by allowing the inconvenient actants to enrol in the network; the responsible innovation zone is a situation of an actor network creation in which all emerging relevant actants are enrolled.

Figure 1 depicts this conceptualisation of a responsible innovation actor network. A harmful innovation externality perceived in a village results in a conflict. The innovators, as the centred actors, either acknowledge responsibility or ignore the problem and demonstrate opportunism. If they accept responsibility, they are willing to sort out identities, roles and solutions to address the harmful outcomes of innovation and allow them as actants in the network. Once that happens, the community moves into the responsible innovation zone (A). If innovators ignore their responsibility, a conflict situation due to the ‘inconvenient’ actants will surface (B). This may also happen in a responsible innovation actor network if it falls apart due to new and emerging ‘inconvenient’ actants that are not allowed to enrol (C). In the escalated conflict situation, third parties - local or national government, a court of law, new policies, rules and regulations or existing informal institutions - may become involved in enforcing or encouraging the innovators to find a solution that allows the enrolment of the inconvenient actants; responsibility is acknowledged and the pollution issue is addressed (D). If this does not occur, the inconvenient actants will remain excluded and the conflict situation within the community remains unresolved (E).

The agenda of centred actors

Looking further into the details of the ANT translation moments, one notable difference concerns the underlying motives of the centred group reflected in the problematisation. In Van Phuc, the shop owners were motivated by narrow short-term commercial interest, the marketing issue of the silk products. With the initial commercial successes, they were able to consolidate their position as centred actors. In Bat Trang, the motives of the early innovators included the collective improvement of the village's competitive advantage as well as addressing the environmental concern.

In the literature, similar power relations debates are raised in value chain governance theory (Gereffi and Korzeniewicz, 1994) and in the literature on network politics, which illuminates the relationship between power and agency in network structures. When some key actors with influence over the governance of a network exert power and dominance, this can result in more self-interest and opportunism occurring in pursuit of short-term gains Gereffi *et al.* (2005). This can lead to broader societal considerations being neglected - a tendency that has been noted in similar discussions about governance (see e.g. Stoker, 1998).

The Bat Trang case is more an example of what is acknowledged in a multi-actor innovation platform (Leeuwis and Van den Ban, 2004). Thus, innovations are not just about technology but also include social and institutional change and involvement of a range of actors. The dynamic social processes in communities are discussed in theories of social learning (Beers *et al.*, 2010)) and the learning action network concept (Clarke and Roome, 1995). These concepts address the conditions for individuals and communities to express and defend their stakes and discourage opportunistic behaviour by dominant actors.

Pushed or pulled into the network

Due to their dominant position, shop owners in Van Phuc gained the power to impose a 'forced' process of specialisation with their terms and conditions on the potential network actants in the silk production, who

felt 'pushed' into the network. In Bat Trang by contrast, the other small ceramics producers voluntarily joined and were 'pulled' into the network.

Glancey *et al.* (1998) observe similar entrepreneurial dynamics in small business service firms. If unemployed people are pushed into entrepreneurship, they are likely to display more opportunistic behaviour. A major implication of opportunism is that human agents cannot be regarded as fully trustworthy, nor acknowledge responsibility. When relationships are freely and voluntarily made and the actants feel represented by the centred actors' group, and there are 'feelings of ownership' (Van Dyne and Pierce, 2004), they are likely to reach out and to invest in the future for society, including acknowledging responsibility for the consequences of innovation that could jeopardise the network.

Homogenous production system versus functional specialisation

The impact of innovations on the production structure manifests itself differently in the two villages. In Bat Trang, new LPG technology had little effect on the homogenous production structure. Progress through ANT translation moments was a relatively straightforward process and did not involve many new roles and identities of the actants to be defined. In Van Phuc, however, the marketing innovation implied a functional specialisation and fundamental reorganisation of the producers' value chain at village level.

A modern market economy is characterised by specialisation and division of labour. Humphrey and Schmitz (1996) describe decentralising and delegating production as the only way to achieve greater efficiency in responding to economic development, in particular globalisation. However, delegation of authority requires trust, which in absence generates the basic conditions for opportunistic behaviour. If innovation implies a specialisation – new functions – and new interactions have to be established, there is the possibility that the centred actors may exhibit opportunistic behaviour.

More specifically, the ANT analysis shows that one type of innovation, the marketing innovation in Van Phuc, influenced the value chain governance structure while the other type, process innovation in Bat Trang, did not. The marketing innovation implied a dominant position of the shop owners in terms of

decision-making in design, production volumes, colours, marketing strategies and price-setting. The silk producers and dyers as suppliers became 'locked into' the value chain, which did not happen in Bat Trang ceramics village. Once marketing actors in the value chain become dominant, they are likely to show more opportunistic behaviour (Gereffi and Korzeniewicz, 1994). This suggests a relation between the type of innovation, as described by Kaplinsky and Morris (2001) and responsible or opportunistic behaviour.

We see similar patterns with the Global Value Chains (GVC) governance typology developed by Gereffi et al. (2005). Bat Trang remained in a so-called 'markets' value chains in this typology. There is an open market for individual buyers and there are some market linkages which persist over time. There is no power dominance implying that the (transaction) costs of switching to other value chain actors are low. By contrast, Van Phuc moved from a market into the so-called 'captive' value chains governance structure. In these networks, small suppliers are dependent on the larger buyers and are therefore 'locked into' the value chain.

Informal institutions

There was a difference in how the institutional context provided a framework for facilitating the creation of a new network. In Bat Trang, the existing informal institutions played a role in providing a point of reference for human interaction and support throughout the network creation process. In Van Phuc, less reference could be made to the existing informal institutional framework, because it was not adapted to the new marketing and specialisation reality.

The functions of formal and informal institutions are discussed in New Institutional Economics (Williamson, 1986; North, 1990). Structural societal changes and division of labour as a result of innovation and specialisation processes require an institutional framework that provides trust, and lowers the transaction costs in overcoming bounded rationality (Raiser *et al.*, 2008). This institutional framework mediates opportunistic behaviour (Nelson and Winter, 1982). The institutional context must adapt to innovations related to human interaction in society. However, innovation changes may evolve faster than institutional change, leaving space for opportunism (Boyer, 2005).

For developing countries, the role of informal institutions is often emphasised in debates on social capital facilitating co-operation and mutually supportive relationships in communities. Social capital is a valuable way of combating many of the social disorders, including opportunism, inherent in societies in transition (Putnam, 2000). If there is no institutional framework to refer to, then a dominant actor group may set and impose new institutional arrangements that serve its interest further enforcing its power base, and allowing it to behave opportunistically and ignore its responsibilities.

Actor network evolution in geographical space

Actor networks are constantly subject to internal and external changes and pressures (Latour, 1987). Time and again actor networks have to reconsider and redefine actants' roles and identities and allow new actants. There is a notable difference in how the actor-networks have evolved in the two Vietnamese villages. In Bat Trang, the villagers, the village administration and ceramics producers jointly learned, identified and agreed about their environmental problem; the problem was resolved within the existing geographical boundary of the village. In Van Phuc, the environmental issue has not been resolved within the village boundary while the opportunistic shop owners look for cheaper silk products outside the village and enrol outside suppliers as new actants. The centre of the network evolves out of the village; the original village actants become redundant and are left behind with the negative innovation externalities.

The geographical space is the context in which the materiality surfaces that may induce responses of proximate community. The ANT analysis suggests three subsequent scenarios: (i) the centred network actors address and resolve the problem, thus allowing emerging 'inconvenient' actants to enrol and the community moves into the responsible innovation zone; (ii) innovators behave opportunistically and do not allow the inconvenient actant to enrol, which results into an on-going societal conflict; (iii) the centred actors 'escape' from the inconvenient emerging actants and look for new opportunities outside the geographical space – the centred actors ignore their responsibility and leave the harmful environmental and social consequences behind.

However, a paradoxical observation is that Bat Trang, although it is in the responsible innovation zone, is losing its competitiveness. Van Phuc is opportunistically in pursuit of new suppliers, raising its competitiveness. Standard economy theory indeed explains that opportunism generates conflict as well as competitiveness. The contrasting cases reveal a notable tension between pursuing competitiveness and responsible innovation within a certain geographical space.

Concluding remarks

Our research interest in innovation as part of development and its relevance for poverty alleviation led us to explore how small producers in northern Vietnam innovate while acknowledging responsibility for the negative externalities of their innovations. We made use of an earlier developed conceptualisation of responsible innovation as a societal process. The applied Actor-Network Theory (ANT) supports the societal process model of responsible innovation in the sense that the responsible innovation zone could be modelled as an actor network in which all relevant actants, including the negative innovation externalities, are enrolled in the network.

From a broader methodological perspective, the ANT lens complements the reviewed theoretical concepts, addressing interactions of societal and institutional actors in pursuit of economic objectives such as Global Value Chains, industrial clusters and innovation systems. ANT provides a dynamic view, through the translation moments, of how a centred actors' group is able to establish itself in a chain or network while imposing identities, roles and terms on other actors. Subsequently, the ANT lens provides insight into the dynamics and evolution of actors' functions and dominance in chains and networks. This allows for an explanation of emerging opportunistic behaviour resulting from innovation and negative environmental externalities.

The comparison of the contrasting cases suggests several possible explanations for how small producers, as innovators working in a cluster, innovate and generate economic benefits while acknowledging responsibility for the negative environmental and social outcomes. The first concerns the agenda of the centred actors' group, either reflecting short-term commercial and individual interest or broader long-term

societal issues perceived in the community. The second explanation concerns the issue of whether the human actants are pushed or pulled into the network. Related to the agenda of the centred actors, the innovation may generate the interest and support of other potential actants, which is likely to result in more shared ownership of the network and acknowledged responsibility. The third explanation involves the type of innovation. Functional innovation constitutes a fundamental change in an existing production structure, implying a buyer-driven value chain, while the network creation is a more difficult process and allows opportunism. The fourth possible explanation refers to the extent to which an existing institutional framework is able to provide countervailing power to prevent opportunism, forcing innovators to acknowledge responsibility.

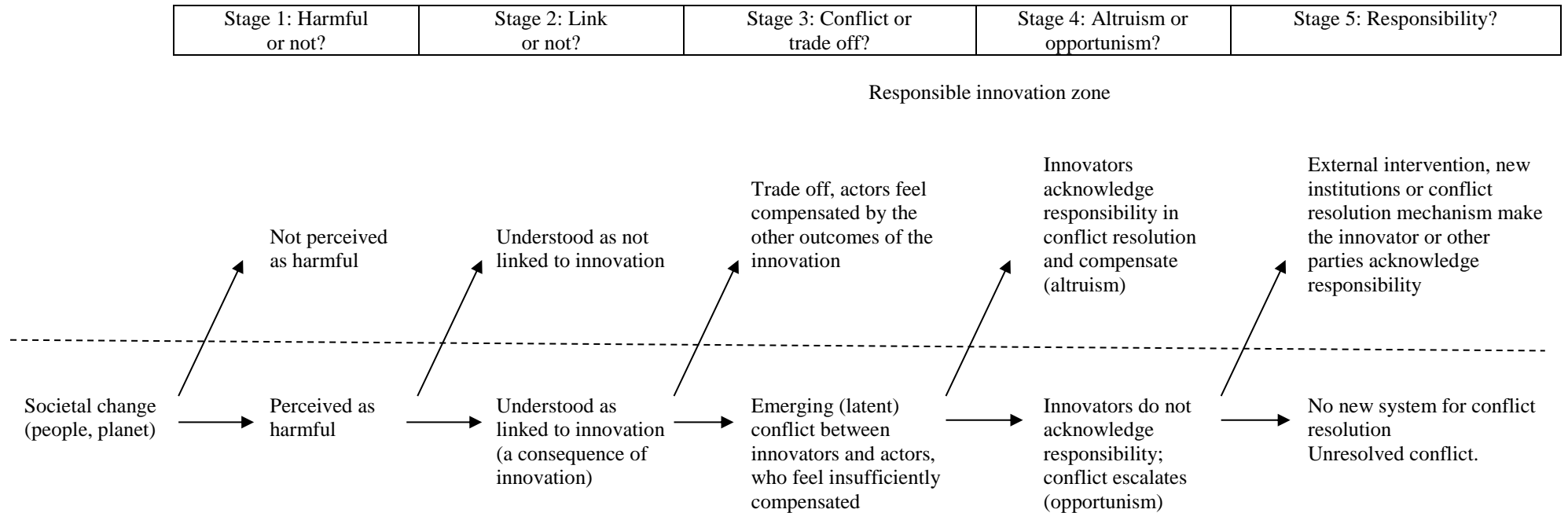
These possible explanations could be used as bases for hypothesis development in further research. This will be challenging in terms of research methodology effort, since the various explanations are quite rudimentary and interrelate with each other. Possible specific research questions could address the conditions required to position a group as centred actors, the factors of agenda setting of the centred group, the push and pull factors, and the facilitation of institutional frameworks and institutional change.

A final issue to consider is the tension between maintaining competitiveness and acknowledging responsibility in conflict resolution within the geographical area of the network. In one case, we observed a dynamic network in which the dominant actors were looking elsewhere for new network actors to strengthen their competitive position. This implies opportunism and generates conflict as well as innovation. In contrast, the more stable and inclusive network in the other village acknowledged its responsibilities but was less economically dynamic and engaged less in searching for new economic opportunities. This raises the question as to whether there is a trade-off between competitiveness and responsible innovation. Can a stable network in one geographical location also be economically competitive? Can competitiveness and responsible innovation complement each other?

Note

1. Kaplinsky and Morris (2001) identified various types of innovation: (i) process innovation, aiming at improving the efficiency of transforming inputs into outputs; (ii) product innovation, leading to better quality, lower price and/or more differentiated products; (iii) business practice innovation, implying new ways of doing business and attracting new clients; (iv) functional innovations - assuming responsibility for new activities in the value chain, such as design, marketing and logistics; and; (v) inter-chain innovations moving to new and profitable chains.

Annex 1: The societal process towards acknowledging responsibility.



A community may accept the perceived harmful societal outcomes as a trade-off for the economic benefits. If not, the model suggests that a (latent) conflict will emerge between innovators and actors who feel insufficiently compensated. Innovators can acknowledge their responsibility and modify their innovation, which is a form of internal regulation, or they can deny responsibility and take an opportunistic attitude resulting in an escalating conflict. Then the external regulation is required by a third party intervention.

Source: Voeten et al. 2012.

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