IHS
Making cities work
Erasmus

IHS WORKING PAPERS

NUMBER 27 / 2013

INSTITUTE FOR HOUSING AND URBAN DEVELOPMENT STUDIES
ROTTERDAM / THE NETHERLANDS

Innovation in SMEs

The case of home accessories in Yogyakarta, Indonesia

By Jan Fransen

IHS Working Paper 27

Innovation in SMEs. The case of home accessories in Yogyakarta, Indonesia

Jan Fransen, March 2013

Table of Contents

Figures

Tables

Summary

Key words: innovation, absorptive capacity, local innovation systems, global value chains, Indonesia

This paper analyses how exporting firms in home accessories in Yogyakarta innovate by absorbing knowledge from local innovation systems and global value chains. Absorptive capacity emerges as the only variable that significantly explains variation in innovation. Innovation does not depend on the type or depth of interactions in local innovation systems, nor on the governance of global value chains, but merely on the ability of a firm to absorb and use the almost endless amount of knowledge available. Absorptive capacity of the sector increases primarily due to the entrance of medium-sized firms with highly educated, local entrepreneurs. This conclusion has important policy and research implications. The policy implication is that innovation is best improved by attracting new firms with highly educated entrepreneurs. This redirects policy attention to the business environment, venture capital and business development support. The research recommendation is to include the notion of absorptive capacity in studies of innovation systems.

Acknowledgements

I would like to thank Bert Helmsing, whose advice has opened my eyes to new theories and research possibilities. He also commented on an almost endless number of draft papers. Farida Kusumaningrum was my research assistant. I will never forget sitting on the back of her motor cycle. Agung Prasetya, exporter, has opened his network for me. This has given me a head start in the research. I thank my family, who has seen too much of my back when I left to Yogyakarta or set behind my computer. Finally I acknowledge all respondents.

1. Introduction

This study aims to understand how firms innovate by absorbing knowledge from local innovation systems and global value chains. In a study of the home accessories industry in Yogyakarta, Indonesia, absorptive capacity emerges as the only variable that significantly explains variation in innovation. Contrary to expectation, innovation does not depend on the type or depth of interactions in the local innovation system, nor on interactions or governance of global value chains, but merely on the ability of a firm to absorb and use the almost endless amount of knowledge available.

The case study assesses innovation of firms producing home accessories. The sector has grown by 6% annually to a US$ 30 billion industry, with most growth taking place in developing countries (USAID 2006). In Yogyakarta, the sector transformed spectacularly from a small handicraft industry into a specialized hub of trendy home accessories operating in global value chains. The sector comprises Small and Medium-scale Enterprises (SME's), creating thousands of jobs, especially among low educated. This age-old industry produces a wide range of symbolic products banking on the rich Javanese culture. This rich cultural base indicates a potentially strong local innovation system. Interaction with local players, such as a school of arts or local skill-based firms, is therefore likely to result in a higher level of innovation. Diffusion of knowledge within the local innovation system is enhanced by weak systems of appropriation. At the same time, the sector of home accessories is buyer-driven, where global buyers drive incremental innovation processes based on their deep knowledge of market demand. It was therefore expected that interactions with global buyers would lead to higher innovation levels. These hypotheses were falsified. Instead, only absorptive capacity of firms explains variation in the level of innovation. This paper therefore poses that absorptive capacity demands more attention in both innovation policy and research. This will be presented theoretically and empirically.

This paper is structured as follows. Section 2 describes innovation theory and zooms in on home accessories in emerging economies. Section 3 offers a background to the (evolution of the) sector and firms. Section 4 explains the research methodology. Section 5 analyzes the level of innovation, also considering its type, mode and source. Section 6, 7 and 8 describe the absorptive capacity, global value chain and local innovation system. Section 9 reports the findings of the model and 10 the conclusions.

2. Innovation theory

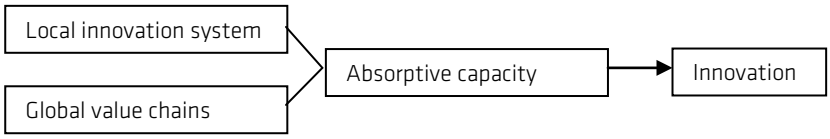
Absorptive capacity and innovation systems

Innovation is the process to develop and improve products, processes and markets, with the aim to aggregate value. The definition is based on a distinction made by Shumpeter between an invention, an idea, and innovation as the generation of value out of an idea (Marins 2008, Cooke 2001). Innovations can be radical or incremental (Jensen et al 2007). Radical innovation entails that researchers and scientific entrepreneurs develop and test new technologies based on scientific knowledge. This is sometimes referred to as techno-globalization, as especially multinationals develop new technologies, which are subsequently produced by suppliers across the globe (Gertler et al 2000). However, high technology SME's also engage actively in radical innovation. This includes spin-off firms and R&D partners of multinationals. SME's are crucial in introducing radical new technologies if the technology gap is large (Nelson 1995, Sternberg 2005). Incremental innovation entails that existing knowledge is combined or slightly adjusted to a local context. Most firms, especially SMEs, innovate incrementally. Even if a firm copies an existing

technology, the technology has to be adjusted to the context-specific routines of the firm which spurs new innovation processes. In increasingly demand-driven markets, incremental innovations enable firms to enter market niches at relatively low cost. Offering a pink mobile phone in addition to a black mobile phone, for instance, already opens up a new market niche. As a result, incremental innovation is a catalyst of economic development for all firms in all countries (Fagerberg et al 2012, Asheim 2009, Nelson 1994, Kaplinsky and Morris 2000).

Innovation studies can bank on increasing interest from three distinct academic disciplines: business, economics and innovation systems. The first focuses on innovation processes within firms, the second studies the role played by innovation in social and economic change, whereas the last studies innovation as a deeply interactive process. A significant number of handbooks and articles integrate the three disciplines. However, Fagerberg et al (2012: 1147) question if this is enough: 'it seems more likely (..) that the different parts that now constitute the field may drift further apart and, eventually, pursue altogether different trajectories, with possible negative consequences for scientific progress in the area (..). A relevant question, therefore, for scholars in this area is what new forms of integration may be needed to ensure that the various parts of the field stay connected and the field as a whole continues to thrive'. This study aims to integrate key concepts of business management and innovation systems, as a small contribution to this quest. It will in particular link absorptive capacity to local innovation systems and global value chains in explaining the level of innovation (see figure 1).

Figure 1: main concepts explaining innovation



The key notion behind the concept of innovation systems is that innovation is an interactive process (Lundvall 2007). Firms constantly acquaint themselves with the latest technologies and market demands in interaction with researchers, buyers, business associations, business development services, finance institutes, firms, friends and family. They also search for knowledge on internet and in articles, periodicals and books. These interactions and searches may be open in order to create a birds-eye perspective of available technologies, or they may be closed, if they are limited to a few actors based on strong ties of association(for instance if firms, researchers and government conduct purposeful joint research, development and testing in triple helix constellations). Interactions take place within innovation systems. The word system refers to a complete set of interactions within a specific boundary. If one interaction is missing, say financial support to innovations, then the innovation capacity of the whole system reduces. A system includes actors that interact, but also a set of common formal rules (governance setting) and informal rules (social embedding). A common understanding of rules eases reciprocal knowledge exchange. The boundaries of an innovation system can be either sectoral and/or geographical (Lundvall 2007, Edquist 2001, Rafiqui 2009, Asheim 2009). A global value chain is a sectoral innovation system and a local innovation system is a geographically bounded innovation system.

Global Value Chains

A global value chain provides an innovation system bounded by a sector, also referred to as a sectoral innovation sytem (Malerba 2011). Global value chains describe the full range of activities which are required to bring a product or service from conception, through different phases of production (involving a combination of physical transformation and inputs of various producer services), delivery to final customers, and final disposal after use (Kaplinsky and Morris 2000). All

firms within a global value chain share cognitive proximity: they share a deep and specialized understanding of a sector, including its technological regime and market specificities. They also operate within the same governance structure of the sector. The same industrial standards and industrial trade agreements apply. Being embedded within a global value chain thus provides access to specific and relevant knowledge, which enables firms to innovate. The opportunities of firms to innovate however depend on the strategies of global buyers and mode of governance of value chains (Gereffi 2005). There are five different modes of governance. The first is arm's length relationships. This offers limited opportunities to innovate, as buyers and suppliers transact but do not interact. Suppliers have access to codified knowledge, but cannot bank on their contacts to acquire additional tacit knowledge. A second mode is captive value chains. These also provide limited opportunity to innovate, as powerful global buyers control brands, designs, marketing and/or market relations. It depends on the strategies of global buyers which activities suppliers will and will not perform. This severely limits opportunities of suppliers to innovate. As suppliers don't conduct allactivities themselves, it is expensive and risky for them to switch buyers. They are 'captive' (Gereffi 2005: 84, Humphrey and Schmidt 2002). Relational value chains, a third mode, provide more opportunity to innovate, as suppliers conduct more activities themselves, have more buyers and can switch buyers at lower cost. Suppliers and buyers develop deep and wide interactions, allowing a flow of tacit knowledge. However, strategies of global buyers may still limit opportunities of suppliers to innovate, because a large number of suppliers depend on a small number of buyers. Buyers may therefore still monopolize specific activities in order to retain a larger share of the cake. In a modular global value chain, suppliers have even more opportunity to innovate. Modular suppliers are specialized in components of final products (modules), which they sell to more buyers. Due to the specificity of their products, they are able to develop deep interactions with buyers on a more equal footing. Finally, in vertical integration possibilities to innovate are highest. When a multinational owns a supplier, it will fully support its innovation processes. Therefore, though all firms benefit from access to specific knowledge in global value chains, opportunities to realize innovations depend on the mode of governance and strategies of global buyers.

Local Innovation System

A local innovation system (also referred to as a regional innovation system) sets its boundary based on geographical and cognitive proximity (Boschma 2005). Its analysis comprises five levels: actors, interactions, governance, social embedding and its context. Firms interact with firms and non-firm actors within a region. They especially interact within their sector and with firms in sectors that require similar skills and technology (Cooke 2012). An important advantage of local innovation systems is that firms can easily meet face to face and check each other's credentials and capacity. If the source is known to be trustworthy, it is more likely that knowledge interactions are reciprocal (Asheim et al 2009). Firms operate within a governance setting and social embedding. The governance setting refers to the capability of non-firm actors, appropriation regimes, incentive regimes, standard setting and factor markets, including financial instruments (Asheim et al 2011, Goel et al 2004). Research incentives in triple helix constellations are widely regarded as an effective instrument to stimulate innovation, especially for radical innovation in science-driven sectors. Appropriation regimes are important, as protection of IP rights eases reciprocal knowledge flows. On the other hand, knowledge diffusion benefits from the absence of protection (Dosi 2006). Social embedding refers to trust and reciprocity. A cluster is a fertile basis for a local innovation system, if its governance structure and social embedding stimulate reciprocal knowledge exchange. However, many clusters in emerging economies are poverty-driven, with limited innovation potential (Knorringa and Meyer-Stamer 1998). Current trends in the international division of labour towards task specialization within clusters make local innovation systemsless likely to be effective as procurement and sales are globalized (Chaminade and Vang 2008. The local innovation system is set within a broader local context. It

comprises the business environment, education systems and the regional ability to attract and retain high educated people. A less favorable context reduces the potential of firms and people to innovate within a given place and sector (Florida 2005, Lundvall 2007).

Absorptive capacity

The firm is the center piece of an innovation system (Lundvall 2007). After all, interacting becomes meaningless if a firm lacks the ability to exploit the acquired knowledge. This capability of firms is referred to as absorptive capacity (Cohen and Levinthal 1990). Absorptive capacity is 'the dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage' (Zahra and George 2002). It comprises four steps.

The first two steps create a potential to innovate and respond to market volatility. Firms attain a large amount of knowledge, but do not yet put this into use. The first step is acquisition. This is the firm's ability to identify and acquire externally generated knowledge that is critical to its operations (Zahra and George 2002). In order to benefit from innovation systems, firms must be able to acquire relevant knowledge. They should be able to filter the almost endless amount of codified and tacit knowledge in order to select relevant knowledge for their specific market segment (Acs and Plumer 2005). Once knowledge is acquired, it should be assimilated (step 2). This comprises the routines of a firm that allow it to analyze, process, interpret and understand information obtained from external sources (Zahra and George 2002). Within firms, gate keepers of knowledge acquire knowledge, which is subsequently assimilated by other staff through communication and training. Both are easier when the knowledge gap within the sector is small and the explorative innovation systems are open and fluid (Flatten et al 2011, van Winden 2011).

The last two steps enable firms to realize their potential. First of all, firms have to transform their routines by combining old and new knowledge (Zahra and George 2002). This requires a willingness to invest, access to finance, management capability and business plans. The last step is to exploit the transformed knowledge and routines. To cash in, innovative products must be matched with attracting (new) market niches and efficient production processes. This ability to balance product, process and market innovation indicates mature absorptive capacity (Teece 2007, Dutrinet 2004 and 2007). To realize absorptive capacity, firms no longer need access to a wide pool of knowledge. Instead they interact in exploitative innovation systems with a small number of trusted actors such as financiers, business consultants and marketing associations (Flatten et al 2011).

Absorptive capacity is determined by entrepreneurship and firm-level attributes. This is studied in business management literature. Entrepreneurship is widely seen as the most important determinant of absorptive capacity in SME's (Marins 2008). The entrepreneur has the ability to solve problems that constantly arise, by recognizing useful information, deciding what new innovation is worthwhile and managing and implementing it. High educated entrepreneurs with relevant working experience perform better than lower educated without experience. (Erikson 2002). Risk-taking propensity is expected to be crucial as well, as innovation by definition requires an investment with an uncertain outcome. Firm level attributes include firm size and organizational structures and routines, such as participation in decision making, job rotation and interdepartmental communication and cooperation (Justin et al 2005, Reece 2007, Piralis and Reece 2009, Sternberg 2007).

Absorptive capacity, local innovation systems and global value chains are hardly studied together, while they are part and parcel of one integral innovation process[1]. All firms acquire knowledge

[1] Absorptive capability is regularly studied as part and parcel of local innovation systems (see for instance Dosi et al 2005, Lundvall 2007 and Criscuolo and Narula 2008) or the other way around (Dutrinet 2007, Teece

from local and global sources and absorb this. This case study illustrates that it is tempting to conclude that one concept significantly explains innovation. In the study, all concepts significantly explain innovation when looked at in isolation. However, the question is what matters most when they are taken together.

Innovation in home accessories in emerging economies

As this study zooms in on innovation in home accessories in an emerging economy, it is worthwhile to briefly consider its specificities.

First of all, it is important to realize that within home accessories innovation processes are incremental and driven by buyers. Contrary to supply-driven value chains, innovation is not driven by the latest scientific inventions but by market fluctuations. Firms require knowledge on the latest market trends, production technologies and management systems. This knowledge is sector specific. As a result, global buyers instead of universities are gate-keepers of knowledge. This enhances the likely impact of global value chains on the level of innovation.

A second specificity is that most knowledge in emerging economies is still derived from global value chains (Mani and Romijn 2004). However, studies in China and India have shown that in low technology sectors the importance of global value chains reduces and local innovation systems become relatively more important. (Altenburg et al 2008, Fu et al 2011). This is especially likely in home accessories, where firms can cater specific market niches based on unique, ethnic design. The importance of global value chains, highlighted as a first specificity, is therefore matched by an increasing importance of local innovation systems.

A third specificity is that most local innovation systems in emerging economies are immature and most contexts are not yet up to par. Characteristics of an immature system are that market transactions dominate, the role of non firm actors is weak, joint research activities are rare and innovation hardly moves across sectors (Chaminade and Vang 2008). In an immature local innovation system, firms mainly benefit from interactions within the local value chain. The relatively weak but improving business environment, and education system reduce the ability to innovate. The question is therefore to what extent the local innovation system has matured, enabling a larger role of local knowledge.

A fourth and last specificity is that the absorptive capacity of firms in emerging economies increases rapidly and varies considerably (Lall 2003). Some firms are informal and poverty-driven, with low levels of absorptive capacity. Generally these firms are smaller, the education level of entrepreneurs is lower and entrepreneurs are less risk taking. At the other extreme, some firms have high absorptive capacity. They are large, connected to global markets, risk taking and entrepreneurial (Piralis and Reece 2009). Absorptive capacity is therefore expected to significantly impact on innovation.

3. Research methods

Research design

The objective of the study is to assess to what extent and under what conditions local innovation systems and global value chains enable exporting firms in emerging economies to innovate and

2007, Chen et al 2011). The relationship between global value chains and technological capacity of firms is also regularly studied (Gereffi 1999, Lall 2001 and 2006, Kaplinsky et al 2000, Ernst and Kim 2002, Morrisson et al 2008). By contrast there is not much literature on the relationship between global value chains and local innovation systems (Chaminade and Vang 2008, Fu et al 2011), nor on the integration of all three concepts (Altenburg 2008).

whether limited absorptive capacity stands in their way. It aims to provide a deeper understanding of the link between absorptive capacity on the one hand and local innovation systems and global value chains on the other: does it matter where firms obtain their knowledge from or is absorptive capacity the main explaining variable of innovation?

The dependent variable is innovation. In the past, patents and number of engineers and architects were used as main indicators, but these primarily measure radical innovation. To also include incremental innovation, the perception of entrepreneurs tends to be used (OECD 2005 and 2006, Indarti 2010). A measure of objectivity is created by associating innovation with economic rents created (Kaplinsky and Morris 2007). The OECD (2005) splits innovation into 12 different types of innovation. Greenhuizen and Indarti (2005) adapted this to 15 types for bamboo products in Indonesia, which are also applied for handicrafts in Yogyakarta (Brata 2009, 2011). These indicators are used to specify the level and type of innovation.

The independent variables are the local innovation system and global value chains. A challenge of the research design is that the local value chain cuts across both. It benefits from collective efficiencies accrued by global value chains *and* local innovation systems. After careful consideration it was decided to treat the local value chain as part of the local innovation system. The reason is that within the local value chain geographical proximity impacts on collective efficiencies, as firms are embedded within a social and governance setting of a geographically compounded space. Exporters are the linchpin between local innovation systems and global value chains. They aim to establish relationships of trust and reciprocity with their global buyers and subcontractors. Trust and reciprocity with subcontractors however runs deeper, because they are part of the same community and are often bound by the same religion. The global value chain is then defined as transactions and interactions between exporters in Yogyakarta and global buyers. This cuts across geographical boundaries. In the analysis, the local innovation system is split up into interactions within the local value chain (firm-firm relationships) and outside the local value chain (firms - non-firm relationships). Firm-firm and firm-non firm interactions are expected to contribute differently to innovation processes (Kaufmann and Toddling 2001).

For the independent variables, indicators were taken from literature to measure the depth and breadth of interactions. Interaction among actors is measured quantitatively by their perceived importance (both as knowledge provider and partner in innovation processes) and qualitatively for their intensity and frequency. Unintended knowledge spillovers are measured based on the amount of labor mobility, observation and copying. Governance of the local innovation system is contextual, as it is equal for all firms studied, whereas the mode of governance of global value chains varies across firms. Five modes of value chain governance were considered, of which three are used in the case study: captive, relational and modular (Gereffi 2005). These are operationalized based on dependency on buyers (selling at least 70% of all sales to one buyer) and use of own brand name (local and abroad). In a captive chain, suppliers have a high dependency on one buyer. In a relational value chain the dependency is low, while the brand of global buyers is used. In a modular value chain the dependency rate is low and suppliers use their own brand locally and globally at times. Governance of global value chains also entails strategies of global buyers (Gereffi 2005) and international standards (Kaplinsky and Morris 2000).

The intermediate variable is absorptive capacity. Macpherson and Holt (2007) and Flatten et al (2010) provide excellent analyses of indicators. The most appropriate indicators were selected based on recent studies in emerging economies (Altenburg 2008, Fu et al 2011). They were adjusted after the qualitative survey.

Firm and entrepreneur characteristics function as control variables. Firm level indicators are firm size (measured in turn-over and number of staff , using the definition of the Government of Indonesia), age and legal status, whereas entrepreneur characteristics entail education level, age,

gender, previous position, training and risk taking propensity (Marins 2008, Erikson 2002, Gaul 2011, Macpherson and Hort 2007). Contextual variables that influence innovation are macro-economic stability, the education system and the business environment. As these are likely to be incomplete in emerging economies, they impact on innovation (Lundvall 2007).

Case study approach

The study applies an embedded single case study approach. A case study approach was selected in order to fully appreciate the influence of the context on the level of innovation (Yin 2009: 18). Especially the influence of the governance and completeness of the local innovation system (Lundvall 2007) and the technological regime of the sector (Nelson 2002) will be taken on board. It is a single case study in order to offer a rich description of the context and dynamics[2]. It embeds a study of a subset of 27 innovative firms, in order to understand innovation processes in-depth.

The research is conducted in Yogyakarta. It is confined to the economic space (Bennet 1997) comprising Yogyakarta city and surrounding areas within 1 hour drive in Sleman and Bantul (referred to as Yogyakarta). Over 80% of all firms are located in the sub-urban area around Yogyakarta. Bantul, which is rich in resources and skilled labor, houses about 70% of all firms. The relatively high density and closeness to the cultural city of Yogyakarta create a conduce environment for innovative firms. As Yogyakarta is one administrative metropolitan area, it creates unity in governance issues.

Sampling

Data is triangulated from three sources: semi-structured interviews, survey and secondary data. Data collection was based on a detailed case study protocol. I was supported by a research assistant for translation, transcription, administration and logistics. 42 semi-structured interviews were conducted, comprising 27 firms, 3 experts, 11 major players of the local innovation system and one global buyer. All interviews were recorded, transcribed and analyzed in Atlas-TI. Firms for the qualitative analysis were identified by snowball sampling, in first instance banking on the contacts of researchers and internet. They were drawn from all firm sizes, sub-sectors and functions in Global Value Chains. I usually interviewed the director/entrepreneur, but when needed meetings were conducted with more than 1 staff of the organization. Meetings lasted about two hours and were followed up by additional questions by phone when needed. Comments from websites, annual reports, marketing material and observations were added to the field notes. This comprehensive process provided in-depth insight into innovation processes. Annex 1 lists firms interviewed.

Within the local innovation system, the chairpersons of the three main business associations, five representatives of local government (one at policy level, one involved in BDS and three in R&D of handicrafts), 2 staff of a financial institute and 2 university staff were interviewed. The information was counterchecked with information from active members of associations and interviews of 3 key researchers on innovation in small firms, clusters and handicrafts in Yogyakarta province.

A survey was conducted of 100 firms based on purposeful sampling. Based on expert information, the sample comprises 100% of very large and large firms and over 50% of micro, small and medium-sized firms. The sample was stratified by subsector (i.e. main material used), firm size and role in global value chain. Sampling was based on the list of exporters of the Ministry of Trade and Industry. Every second listed firms was selected. In line with other studies, 20% of the firms selected did not or no longer exist (Indarti 2010). They were replaced by the next listed firm. As the list excludes small subcontractors and large exporters with owners from outside

[2] The study is part of a multiple case study, also including Shanghai and Cape Town.

Yogyakarta, those were added based on snowball sampling. Through snowball sampling, the whole value chain was included in the study

The sample includes all subsectors (table 1) and all roles and levels of the value chain (table 2). Pottery and wood are the largest subsectors and have traditionally been clustered, enabling an analysis on the role of clusters in innovation systems. Almost all firms offer products of more than one material or add other materials to their products, indicating that home accessories operate as an integrated sector.The market of home accessories is not structured according to material but in accordance with function. For instance, sculptures of wood, stone and pottery are part and parcel of the same market segment. The traditional clustering of firms per type of material has been replaced by clustering around market demand.

Table 1: survey sample per subsector and firm size (turn-over)

Firm-size	Wood	Pottery	Stone	Paper/ plastic	Wickerwork	Leather	Silver /Metal	All	Total
Very large: Above US$ 1 mln	1	1	0	0	0	0	2	6	**10**
Large: US$ 240,000 - 1 mln	2	2	1	1	1	0	0	5	**12**
Medium: US$100,000-239,999	2	3	3	0	2	2	2	3	**18**
Small: US$ 10,000-99,000	9	6	3	1	6	2	2	5	**34**
Micro: Below US$10,000	6	6	2	4	4	0	2	0	**24**
No response		1					1		**2**
Total	**20**	**19**	**9**	**6**	**13**	**4**	**9**	**19**	**100**

Table 2: survey sample per subsector and position in global value chain

	Wood	Pottery	Stone	Paper/plastic	Wickerwork	Leather	Silver/Metal	All	Total
Exporter	6	2	2	1	2	2	4	12	31
Combination	2	5	1	0	0	2	0	1	11
Subcontractor	12	12	7	5	11	0	5	6	58
Total	**20**	**19**	**10**	**6**	**13**	**4**	**9**	**19**	**100**

4. Background

This section describes the transformation of the sector, its market niche and firm characteristics.

Transformation of the sector

The sector transformed from a traditional, mainly poverty-driven industry into a specialized node in global value chains. Such processes are sector-specific, due to the complexity, cumulativeness and appropriability of technology (Nelson 1994 and 2002). Home accessories have relatively low complexity and weak rules of appropriability, which enable fast transformation processes.

Absorptive capacity accumulates when firms obtain more experience, creating barriers of entry. As respondent #1, 5 and 53 note, this has reduced global competition to a few comparable locations, especially in Thailand and the Philippines. The transformation of the sector can be described in three phases.

Phase 1: survival-oriented and dynamic clusters. Until 1990, most firms use only one material which is sources locally, with designs primarily based on Javanese culture. Informal, small firms were clustered in villages, driven by locational externalities. Due to availability of raw material and a skilled labor force, firms were able to produce for global markets (Ismanilda 2011). Industrial structures were socially embedded, but not very dynamic and often poverty-driven. Two clusters were considered to be more dynamic: silver, due to demand and knowledge of the Dutch occupiers, and leather, due to exports (Isminalda 2011). These clusters still exist, though they are now either included at the bottom of global value chains or transformed into trading and knowledge centers.

The state of the home accessories sector at this stage illustrative for the technologically distorted policies that were established by Dr Habibie, Minister of Research and Technology during the Soeharto period. A few firms in monopolized high technology sectors were heavily subsidized, in an attempt to create a first class industrial sector. Especially during the oil boom (1974-1981), the government adopted an interventionist approach that benefited state-led industries. At the same time policies restricted export opportunities. These market failures reduced opportunities of small firms to innovate and export. The Soeharto period however also laid the base for second stage, as basic education improved sharply, domestic markets grew by about 7% annually and absorptive capacities[3] of small firms improved. In 1983, the end of the oil boom sharply reduced export earnings, starting a gradual shift towards export promotion. From 1983 to 2002 export grew by 27% a year (Wie et al 2006).

Phase 2: golden age of handicrafts. In 1990 Out of Asia relocated from Bali to Yogyakarta in order to benefit from the raw materials and low salary levels, about 1/3rd of salaries in Bali. Out of Asia was led by an Australian designer, well aware of western markets. Being the first high educated to enter the sector in Yogyakarta and being the first trading company that targeted the global market of home accessories, it had an immense impact on the sector. Products became contemporary, materials were mixed, poverty-driven clusters producing for Out of Asia were included in global value chains of home accessories and global buyers became main sources of knowledge.

The change was triggered by the depreciation of the Rupiah in 1989, As a result, small firms which export based on local material and low labor costs became lucrative. By contrast, exports of large firms, whom had lost their subsidies, dropped by 10% (Wengen et al 2006). According to respondent #5, who worked at Out of Asia at the time, the standard profit margin at the time was 42%. Many high educated entered the rapidly growing sector lured by seemingly endless export potential. Some started their career at Out of Asia (8%), which is why the sector refers to Out of Asia as 'the university of craft'. Firms that entered more specialized market niches noted margins of 50% up to 100% (resp. #5, 11, 53). Exporters experimented with captive value chains (resp. #6, 10, 12), with low-medium and high cost market segments and with different levels of subcontracting. Technology and industrial structure were not yet set. As noted by resp. #37, now a university teacher: *I joint Out of Asia in 1998. There were not many trading companies at the time. After 2000, many companies started small and became big. (..) We called the new firms 'Out of Asia Alumni'.*

Phase 3: crisis induced innovation. Since 2002 a range of external shocks severely tested the resilience of the sector. These shocks included the Bali bombing in 2002, an earth quake in 2006

[3] Wie et al (2006) refer to technological capabilities.

and the global financial crisis since 2008. The Bali bombing about halved demand from tourists, but had a limited impact on exports. The earth quake destroyed stock and factories, which created financial constraints and seriously threatened the potential of firms to deliver. Respondent #10, for instance lost his factory due to the financial crisis and subsequently lost his clients because he could no longer deliver orders. NGOs and Development Aid came to a rescue, enabling exporters to attend international trade fairs and firms that were destroyed to be reconstructed. NGOs thus became intermediate players in innovation system. The financial crisis subsequently about halved exports to the USA and Europe. This was partly rectified by increased demand in emerging economies, including Indonesia itself, but still the main issue for many firms became how to survive (resp. #1, 9, 33).. According to resp. #9: '*Firms went bankrupt because they were opportunistic, taking on large orders without calculating profit margins and without being able to deliver. They lacked management capacity*'.

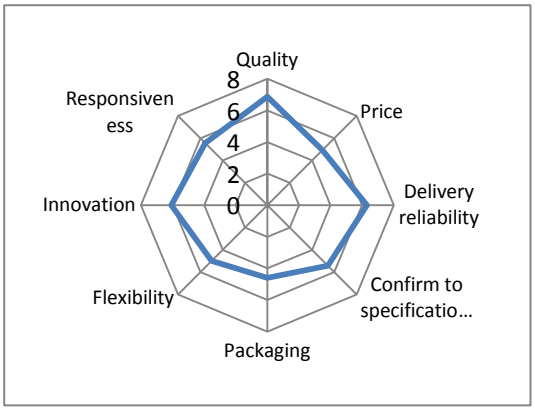
After a phase in which development opportunities were relatively open, the development path narrowed down. The crises matured the sector. The market segment became clearer, with all firms focusing on the medium to high end of the market. Weak firms went out of business, creating a process of creative destruction. Industrial structures were reset, traditional clusters became part of a larger clustering of firms and the speed of innovation became even faster (Resp. 15; Tambunan 2006B).

Market niche

During phase 3 the market niche became clearer. After a more diverse start, Yogyakartan firms now mainly operate in medium to high end home accessories, where quality, innovative design and ability to deliver are critical success factors (see figure 2). Products are hand-made or produced with light machinery. They are high quality, made of natural local materials and often labeled as environmental-friendly. Production quantities are small to medium-sized. A few firms, such as resp. #1, 11, 15 and 53 produce top-end design products with high profit margins, but most firms operate below the top market segment with margins ranging from 10% to 30%.

About 80% of all firms produce contemporary designs for Western and Asian markets, while about 15% produce traditional Javanese masks or sculptures, and 5% sell art.

Figure 2: critical success factors according to entrepreneurs



Source: qualitative survey (N=27)

The market niche can be explained by considering externalities of Yogyakarta and collective efficiencies in global value chains. Locational externalities are those externalities that stimulate a single industry. They tend to be associated with reducing returns (Cooke 2012). They include the high quality of natural resources, availability of skills and high un- and underemployment levels. As Yogyakarta has a large population in relatively unfertile surrounding rural areas, its salary levels are relatively low. This explains why hand-made production is cost-effective. Jacobs externalities draw on urban diversity and related variety, which specifically stimulate innovation (Asheim et al 2011). These include that Yogyakarta has a relatively large number of designers, artists and other high educated as well as related industries such as furniture, garments and leather products. However, the market niche cannot be explained fully by locational and Jacobs externalities. In the volatile global markets of higher priced fashion products, global buyers scout for designs within relational value chains. This forces firms to keep a large portfolio of products in

stock as well as a large database of potential buyers. The interplay between market demands for innovation and externalities thus push the sector towards middle to high end product markets.

Description of firms

The firms comprise exporters, subcontractors, their subcontractors and firms that combine roles (see table 3). Exporters perform knowledge-rich activities, such as marketing, design, producing samples, finishing of products and quality control. Packaging and labeling is done by exporters if it adds value. Exporters also manage the local value chain, with 80% of exporters subcontracting routine production activities. Exporters have the largest size in terms of turn-over, staff numbers and total staff (in-house and subcontracted; see table 3). 82% all exporters are locally owned. The entrepreneur is typically a middle aged and highly educated male, with considerable international exposure.

Subcontractors are typically small or micro firms, in about 50% of the cases located in a traditional, poverty-oriented cluster. They work from home, with casual workers generally sitting outside on small chairs or on the ground. The entrepreneur manages the firm and, with the exception of some larger subcontractors, have no departmental structure. Some top-level subcontractors have become specialized suppliers, producing for many subcontractors. They in turn manage their own subcontractors. At the bottom of the chain, the smallest firm has an annual turn-over of US$2,700 year, with highly irregular orders. This level of the chain only receives orders when the pool of orders is large. They pay the price of volatile markets. The mean gross profit margin of subcontractors is 15%, a bit lower than that of exporters. Entrepreneurs are considerably lower educated than exporters and have often learned their skills from their parents, or as apprentices at subcontractors or exporters.

Those who combine export and subcontracting have characteristics in between exporters and subcontractors. It includes respondent #13. The entrepreneur is a highly educated and respected designer. He has won design prices, and is regularly asked by exporters to design a new product range. He however does not speak English and lacks financial reserves, due to which he has been unable to develop a portfolio of global buyers, At times he sells to global buyers who visit Yogyakarta, but otherwise he focuses on product innovation and production.

Table 3: key characteristics of exporters and subcontractors (mean)

	Exporter	Subcontractor	Combination
	N=33	N=58	N=9
Annual Turn Over (US$, average last 5 years)	$996,651	$53,176	$174,980
Staff number	81	16	25
Number of workers at subcontractors	311	32	68
Staff in-house and subcontractors	393	48	93

**All differences are significant at a 0,05 level, using a two-sided t-test with Bonferroni correction.*

5. Innovation

This section will describe the level, type, mode, source and impact of innovation. It will prove that firms are highly innovative. They combine different sources and modes of knowledge in iterative and incremental innovation processes. The section will explain how innovation creates economic rents and resilience.

Level of innovation

In accordance with academic practice, the level of innovation is measured in a likert scale[4] by asking the opinion of entrepreneurs. OECD takes this as their main indicator of innovation (Indarti 2010, EU 2008, OECD 2006). Most studies take the perceived level of innovation as sole indicator, but a combination of perceived innovation level with perceived newness of products proves more reliable. Perceived innovation has shown a social desirability bias, as some respondents score lower for religious reasons. As respondent #5, a devoted Muslim, noted: *I must be humble, I cannot give myself a high score.* Yet he noted that his products were new to the world. The two indicators are highly and significantly correlated (r=0.535, α = 0,01), creating internal reliability. Good Outliers were checked. To test if the computed indicator not only measures perception but also reality, the indicator was correlated with other innovation indicators. The analysis concludes that the indicator corresponds significantly with the introduction of new products (Kendall's test: T_b=0,376, n=98, α=0,000) and with indicators of economic rent and resilience[5]. Also, firms that won design competitions (resp. # 3,5,8,14,16 of the qualitative survey) are all (very) innovative, just like firms that applied for patents. Resp. #2 notes: '*We are innovative. We produce for Zara Home, which is a top design-driven institute. As they visit us twice a year, we always have to show them new products'.* The computed indicator is therefore considered to be reliable and valid.

Table 4: innovation level (likert scale) by firm size

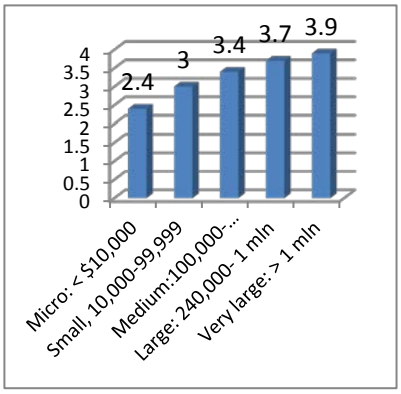
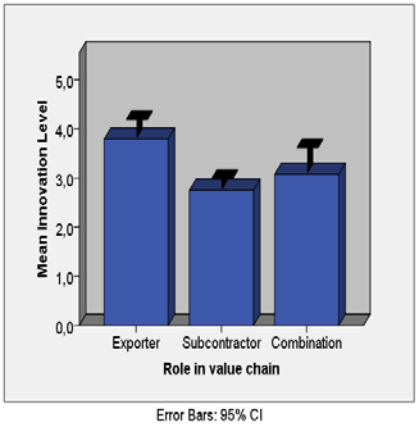


Table 5: innovation level (likert scale) and role in value chain



51% of all firms perceive themselves to be (very) innovative, 38% as neutral and 11% as not (very) innovative. This conclusion is in line with other studies conducted in Indonesia[6]. Ismalina (2010) for instance reports the same innovation level (51%) of firms in three dynamic clusters operating in home accessories in Yogyakarta. The Chamber of Commerce in Yogyakarta and the Centre of Handicraft and Batik also applaud the innovativeness of the sector.

The level of innovation fluctuates depending on the role of firms in the value chain and their size (resp. table 4 and 5). A multiple regression analysis assesses which factor(s) significantly impact on innovation[7]. The analysis concludes that innovation significantly depends on the position of firms in the value chain. Exporters are thus significantly more innovative than subcontractors.

---

[4] Likert scales are commonly used in questionnaires. Risks in using a likert scale are a central tendency bias, acquiescence bias and social desirability bias (www.wikipedia.org, 12-2-2013). To overcome these risks, indicators were thoroughly tested on validity and reliability

[5] Regression analysis: innovation level explains a growth in number of buyers (α=0.001, r^2=0.106, β=0.428).cost reduction (α=0.000, β=0.456, r^2=0.130), increase in product quality (α=0.003, β=0.333), r2=0.092) and an increase in quality of staff (α=0.002, β=0.329, r2=0.095). It does not explain a better ability to deliver on time (α=0.874) or price increase (α=0.236).

[6] Brata (2009) reports that more than half of all bamboo firms in Yogyakarta province (Sleman) are innovative. Indarti (2010) reports a much lower score of innovation in furniture industries (mean of 2.1 on a likert scale compared to 2.4 for micro firms in this study). However, this study only considers exporting firms, which are more innovative.

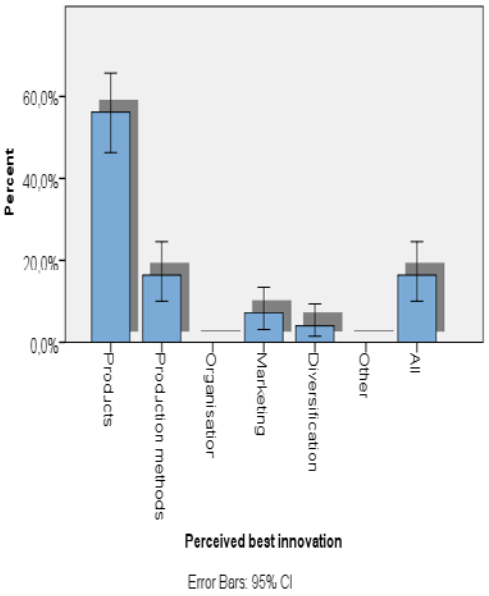
[7] Multiple regression analysis with firm size indicators: α=0.000; β of position in value chain = 0,417, t=4,351; excluded variable: annual turn-over, staff number, staff of subcontractors).

Remarkably, firm size is not a significant explanator of innovation levels. Differences in innovation by firm size are caused by different positions within the value chain.

Type of innovation

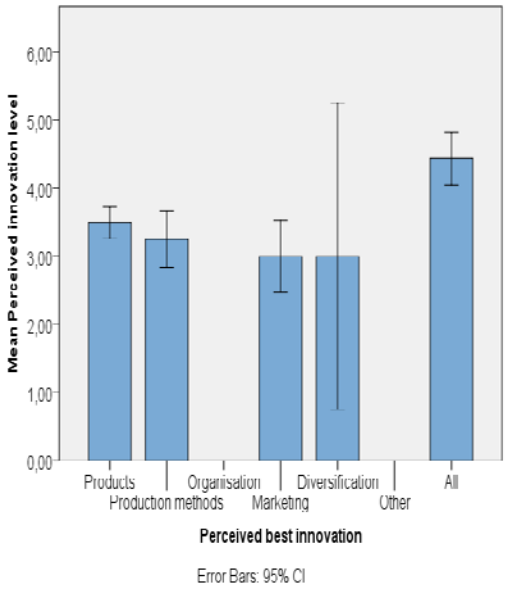
A broad range of innovations takes place, which are grouped into product, process and market innovations. Diversification is defined as new product development outside the home accessories sector (generally in furniture, hotels and restaurants). Most firms (57%) perceive themselves to be best at product innovation, followed by much smaller numbers on production processes, all aspects, marketing and product diversification (see table 6). The finding is as expected, as product design is considered to be the key to success for middle to highly priced products in home accessories (UNCTAD 2008, 2010). The types of innovation are also comparable to innovations in the furniture, software and bamboo industry in Indonesia (Brata 2009, Greenhuizen and Indarti 2005, Indarti 2010). The qualitative survey found a larger share of firms which innovate on all aspects, but as the survey focused on more innovative firms this outcome is as expected.

Table 6: type of innovation



Firms which are innovating products, processes and markets equally well are significantly more innovative (see table 7)[8]. On the other hand, firms that innovate products best are not significantly more innovative than other firms (α=0.098). Product design is thus not the key to success, contrary to common belief. Instead, the careful balancing of new products with markets and production processes is.

Table 7: type and level of innovation



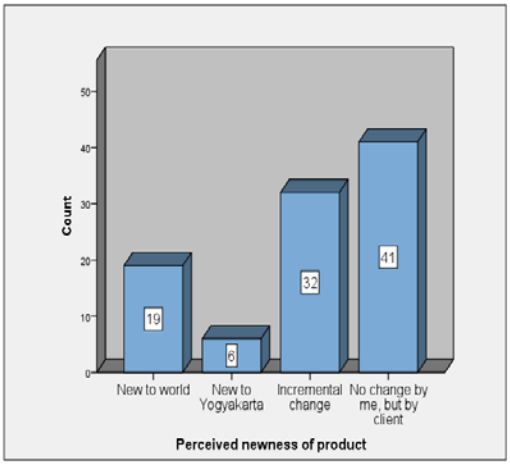
I will now describe the types of innovation in more detail.

Product. Product innovations are analyzed by level of newness (EC 2008, OECD 2006).26% of all firms develop products that are new to Yogyakarta or new to the world (table 8). It includes for instance respondent #11, who designs bathroom accessories by adjusting and combining products and materials from Yogyakarta. These materials have to become water- and scratch resistant. It takes the owner 1.5 year of research to develop a new product range, which is then developed in different styles. Each style is unique and is normally sold to only one client at 100% net profit margins. Respondent #7 develops products that are new to Yogyakarta. He is the first to develop a wooden garden table with ceramic inlay and large sculptures of clay, ceramics and metal. Being the first, it took him 2 years to develop production processes. Three firms patent their products (#1, 53 and 57). In all three cases, the product demands highly specialized production techniques and the number of sales is large.

[8] Linear regression analysis between the dummy of innovate all (independent variable) and innovation level (dependent variable): α=0.000, β=1.605, r^2=0.435.

Most firms (74%) receive product specifications from their clients or incrementally adapt existing products. They refer to it as the ODM model (Observe, Duplicate, Modify). Incremental changes include for instance changing colors of existing products. Adjusting colors to new market niches lengthens the product life cycle and attracts new target groups. The growing Asian market demands much brighter colors than western markets. Respondent #1 illustrates that incremental change can be creative as well: *When I joined trade show in Hongkong, I felt being the poorest, as other firms presented their diamond products. So when I came back I made the series of jewellery I called the fake diamond collection. I brought to Mutu Manikam exhibition in Jakarta and it worked well.* By contract, respondent #9 refers to *stealing designs from internet.*

Table 8: perceived newness of products



Most firms (40%) change their product design quarterly, when a new season demands new colors and designs. 27% of all firms change their product design even more regularly and a further 26% changes its product design (bi)annually. Exporters offer these adapted products to their clients, whom pick and select a few.

The level of product innovation significantly depends on the position of a firm in the value chain. Firm size only impacts on product innovation due to different positioning in the value chain [9]. Exporters develop considerably more new products (48% of all firms) than subcontractors (15%). They only rarely receive all product specifications without any modification needed from their buyer (18%), whereas bottom-end subcontractors on the other hand tend to receive detailed product specifications (71%). Bottom-end subcontractors receive their specifications from subcontractors and exporters. Product innovations thus trickle down the value chain, with exporters acting as gate keepers.

Process. Though only a few firms focus on cost reduction in production or on organizational improvements, all firms innovate their production processes in order to reduce cost and/or improve quality and reliability of delivery. This includes minor changes in production processes, such as reducing the number of rejections (resp. # 3), organizing technical audits and better organising production (resp. #5), introduce molding (resp. #6), asking your staff to cut 5 pages in one time instead of 1 (resp. #8), re-organising the management structure (resp. #9), improving human development management such as bonuses and staff appraisal (resp. #11) or more regular quality control of subcontractors (resp.# 22). Innovation is triggered by the market and by new rules and regulations. Especially environmental regulation forces firms to change raw materials. This includes using environmental friendly glue, paint and other materials, changing the treatment of wood and better quality control on electrical equipment such as lamps. But there are no large investments in capital-intensive mass production. This is not only considered risky in volatile markets, but also not in line with the growing demand for hand-made products. Radical shifts in production processes are rare but do occur. In silverware, for instance, market demand shifted from crafted silver – the traditional skills of Yogyakarta - to filigree. This requires a radically different production technique. Most exporters were able to absorb these market dynamics by relocating production from the cluster Katogede to the nearby city Wonosari. New

[9] Stepwise multiple regression analysis with innovation level as dependent variable: α=0,000; β of value chain position = 0.397; r2=0.258. Excluded variables: annual turn-over, staff number, staff at subcontractors.

subcontractors were trained in the new techniques and new quality control systems were established, but many subcontractors in the Katogede cluster went bankrupt.

Market. All firms constantly evaluate and adjust the position of their firm within the market in which they operate. Most market innovations are incremental. This includes changing a showroom into a gallery (resp #1), no longer bargaining on price (resp. #1), applying for certifications as quality stamps (resp. #1,3, 8, 14, 17), establishing brand reputation locally (resp. # 3), running a Go Green Campaign (resp. #14) or setting up internet campaigns (resp. #18). Many firms started selling locally, as the market in Indonesia is booming. Branding and reputation are of increasing importance. Some firms repositioned themselves in markets more radically. Respondents #6, 10 and 12 radically altered their market position. They decided to end their captive value chain relationship with IKEA based on the advice and support of CBI. The reason was that the profit margins were considered to be too small and the dependency on one client too risky. The strategic innovation had large implications on product development, quality systems and marketing. Other firms decided to diversify in order to reduce risk or specialize. Respondent #11 repositioned himself into the market in order to sell larger quantities: '*I decided to produce bathroom equipment, as customers buy a set of products instead of just one product. Most of my buyers order 25 to 100 sets. We produce 300 sets for a hotel in Bali, 200 for a hotel in the Maldives and sets of the palace of the king of Abu Dabi*'.

Source of innovation

The importance of sources was measured by simply asking respondents to indicate the importance of each actor (table 9). Figure 3 visualised the importance. These are grouped as global value chain, public sources or local innovation systems. Global value chain sources include global buyers and their representatives in Jakarta. Public sources include internet, trade fairs, books and articles. The local innovation system includes all actors operating in the locality, including those within the local value chain. Firms attach the highest importance to knowledge from global buyers and internet. Clearly, knowledge from abroad is considered crucial for innovation. This indicates that the sector on average follows global trends as communicated by global buyers and searched on internet.

Exporters have strong in-flows of knowledge from global buyers, internet and trade fairs, supplemented by knowledge sourced from less important actors. Knowledge from the local innovation system is of secondary importance. Public sources are more important than would be expected based on other Indonesian studies (Indarti 2010). However, in a related study on the impact of internet suggests that the impact can be significant (Gaul 2011). Global buyers are considerably more important sources of knowledge than local actors, as they provide essential market information and information on technologies and production processes. Global value chains bank on cognitive proximity. In the words of resp. #14: *I have designer friends in Japan and Singapore with whom I discuss new designs.* Also resp. #3 and 11 feel a stronger affiliation with designers abroad than with local designers. This suggests that first movers may find stronger cognitive proximity to first movers abroad than to local firms.

Subcontractors in general attach less importance to knowledge, as is illustrated by the lower scores. They also innovate less. It is remarkable that subcontractors value knowledge from global buyers more than from exporters, despite the fact that they hardly have direct contact with global buyers. Clearly, they appreciate that exporters also depend on knowledge of global buyers. As resp. # 20 notes: *I have to know the taste of the market. I get information from export companies: when is the exhibition, what is the trend this season, what design is needed. (..) I go to exhibitions to see what buyers select.*

A large share of knowledge thus originates from abroad. In the past both global buyers and open sources were primarily located in Europe and the USA. As European designs are about ½ year

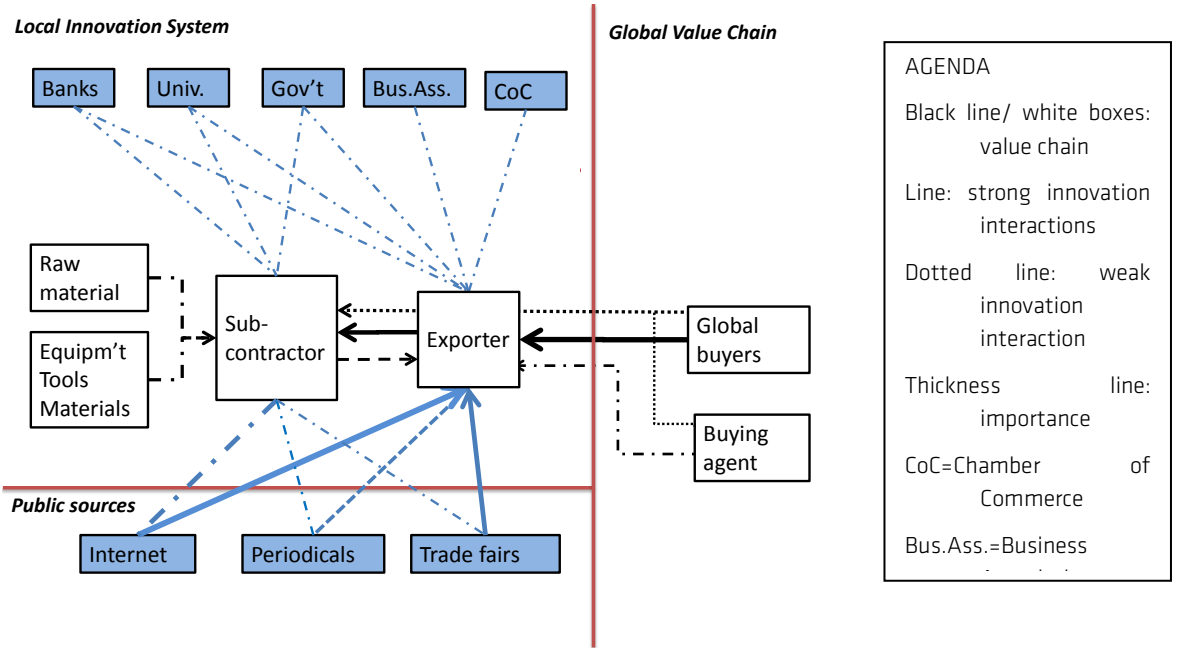
ahead of USA designs, firms with European clients have a head start. However, 47% of exporters interviewed in-depth (8 of 17) report that their market has significantly moved east since the financial crisis started. As Asian markets demand different design and critical success factors of products, this changes the rules of the game. At least for the short term it seems that the financial crisis strengthens a relocation of knowledge from the west to the east.

Table 9: mean sources of innovation (N=100, likert scale)

Source of innovation		Role in value chain			
		Exporter	Subcontractor	Combination	Total
Open	Internet *	4,6[B]	3,0	4,4[B]	3,7
	Articles and books *	3,4[B]	1,9	2,6	2,4
	Trade Fairs	3,9[B]	2,5	3,6[B]	3,0
	Total	**3.97[B]**	**2.47**	**3.53[B]**	**3.04**
Global Value Chain	Global buyers	4,4[B]	2,8	3,9	3,4
	Buying agents in country	2,3	2,0	2,9	2,2
	Total	**3.45[B]**	**2.43**	**3.40[B]**	**2.84**
Local Innovation System	Exporters	1,7	3,7[A]	2,8	3,0
	Local firms/ subcontractors	2,2	2,8	3,0	2,6
	Chamber of Commerce	1,9	1,4	1,8	1,6
	Business Association	2,0[B]	1,3	2,6[B]	1,7
	Cluster Association	1,5	1,5	1,9	1,5
	Government	2,3	2,0	2,8	2,2
	Universities	1,9	1,4	1,9	1,6
	Finance Institutes	2,1	2,2	2,7	2,2
	Total	**2.00**	**2.04**	**2.49**	**2.07**

[B]=significant difference based on two-sided tests assuming equal variances with significance level ,05. For each significant pair, the key of the smaller category appears under the category with larger mean. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

Figure 3: sources of innovation



Impact of innovation

Innovation significantly results in an increased number of products and buyers, better quality of staff, cost reduction and increased quality of products, but had no significant impact on product price and ability to deliver on time[5]. Product price is under pressure ever since the financial crisis started and hence – no matter who comes up with new designs – the lowest possible price is negotiated. Innovation has no impact on the ability to deliver on time, because all firms are able to deliver on time. Impact on profit margin could not be proven, as the data received proved unreliable.

Innovation creates economic rents, especially relational and product rents. They can be endogenous or exogenous (Kaplinsky and Morris 2000). Relational rents are primarily exogenous, as they accrue at level of global value chains. Global value chains create barriers of entry, within which all firms benefit from available knowledge. However, exporters benefit more, as they manage international relations, which they can use to obtain both relational and product rents. They link global knowledge to local production. Better and faster access to tacit knowledge on global markets and specific needs of buyers, enables them to innovate faster and better. Top-level subcontractors benefit more than bottom-level subcontractors, as they have more constant orders and higher turn-over. Bottom-end subcontractors are a reserve labor force that enables the sector to take on large orders when they arise.

Relational and product rents also accrue at the endogenous level of the location. These rents, however, do not benefit first movers. In the contrary: they obtain most knowledge globally, while their knowledge is (illegally) copied locally. But this process does enable knowledge to spread across firms. As product designs are copied, product rents are quickly shared across firms within the locality. The sector thus upgrades, as knowledge is shared within value chains and spills over across chains. Some firms actively try to protect designs in order to maintain their firm-level rents. Endogenous and exogenous rents have increased over time, as absorptive capacity of firms improved. Higher absorptive capacity enables firms to obtain higher economic rents.

Innovation also creates resilience to cope with the uncertainty of volatile global markets, natural disasters and policy changes. Resilience is created, as more innovative firms have a large latent database of potential buyers, a large pool of actual buyers and a large product range[4]. The practice of subcontracting creates flexibility and reduces risks. The aggregate of all innovations leads to a highly resilient growth sector, able to produce small and medium-sized orders of medium- to high quality design products in highly volatile global markets. New profitable functions have been added over time, especially related to trading, packaging, insurance and quality control.

6. Absorptive capacity

Absorptive capacity is a precondition to innovate. Firms noted constraints to innovation that relate to both potential and realized absorptive capacity (table 10). Remarkably, the most important constraint mentioned by respondents is access to knowledge, which relates to the first step of absorptive capacity. The other constraints relate to subsequent steps.

Table 10: 3 top constraints mentioned by respondents in order to innovate

Constraint		% of firms
Potential AC	Knowledge of market trends and technologies	45,5%
	Designer cannot translate concepts into designs	14,3%
	Capacity of management	6,1%
Realised AC	Capacity of subcontractors	37,4%
	Capacity of suppliers or exporters	4,0%
	Acces to finance	42,4%
	Time of entrepreneur	25,3%

Process

Acquisition

Acquiring up-to-date knowledge outside Indonesia enables firms to be one step ahead of local competition. International acquisition requires capabilities such as speaking foreign languages and concrete activities such as travelling and observing. It is measured as the sum of travel and language. This computed indicator has internal validity, with a strong association between travel and speaking languages. Observing local firms has been left out due to its negative association with other indicators (annex 3, table 1) and insignificant impact on innovation (α=0.227). In a linear regression model, acquisition explains 30% of variety in innovation among firms (R^2=0.302) in a highly significant model (α=0.000). The ability to acquire international knowledge has a strong impact on innovation (β=0.560).

Firms are especially able to acquire knowledge on products and markets, but less so on processes and organizational structure. This is in part explained by market insecurity. As respondent #2 expresses: *We are not really looking into the opportunity to modernize machines. The investments would be huge and demand is unsure. If you want to modernize, you have to specialize in one product. We prefer to have more products. What if stone is no longer trendy?´*

Exporters have a significantly better ability to acquire knowledge, as they speak English and travel abroad regularly (annex 3, table 2). Resp. #11 is an example of an exporter with strong international acquisition. He travels abroad a few times a year and speaks English fluently. This is closely interwoven with the entrepreneurial background. He conducted a Masters in Business Administration in Australia, worked in Australia, worked for Out of Asia in Yogyakarta, managed a German company in Indonesia, attended courses in the USA and regularly visits international trade fairs. His awareness of western markets, business culture and communication styles create particularly strong assets in acquiring international knowledge.

Assimilation

Knowledge is generally acquired by the entrepreneur, who visits trade fairs, speaks to the buyer and travels. In large firms, the marketing department visits trade fairs. Others in the firm must be able to assimilate the acquired knowledge before new knowledge can be applied within the firm. Assimilation is measured by four indicators: (1) the ability to design new products based on vague and complex concepts of upcoming market trends. This is considered problematic, as university graduates are not trained in market-oriented industrial design. (2) Number of departments. Having marketing, production and design departments creates capacity to assimilate knowledge. Without those departments, an entrepreneur can't hand over to

managers. (3) Staff training. (4) Active involvement of staff in innovation processes. The impact of the indicators on innovation and their association is given in annex 3, table 3 and 4. The indicators were computed into a new variable that measures assimilation capacity. The internal validity of the new indicator is strong, due to the strong association. The education level of managers was not included in the computed variable, as it proved to be an insignificant and unrelated indicator.

As expected, the ability to assimilate knowledge has a significant and strong impact on innovation, explaining 35% of variance in innovation[10].

Transformation

The ability to transform depends on the willingness to invest, availability of finance, business plan and management capacity. Access to finance is seen as a major constraint by firms. However, firms primarily borrow money for production, as most buyers pay 50% or more after delivery. Some firms face the specific constraint that they lost their factory during the earth quake, ran into financial difficulty during the financial crisis or still have a small financial base. However, most firms only borrow money to pre-finance orders and are less willing to borrow money for risky innovation activities.

Willingness to invest, access to finance and business planning strongly associate and were computed into one transformation variable (annex 3, table 5). Contrary to expectation, however, transformation does not impact on innovation at all (α=0.755). The reason is to be found in the industrial structure. For exporters to transform 'their' production capacity, they must also transform their subcontractors. If subcontractors can't produce a new product on the spot, the exporter loses its cutting edge. Hence, exporters don't only transform their own company but use their management capacity and financial resources to transform their whole local value chain. It is at this stage that value chain rents emerge.

Respondent #3 expresses how Out of Asia continuously transforms its subcontractors: '*When Out of Asia introduces a new design, communities [subcontractors] say that they cannot make it. Then they work patiently with the community until they can. This is a painstaking process of trial and error*'. As a result of these painstaking processes, some subcontractors have been able to build up their absorptive capacity. They have become top-level subcontractors with their own subcontracting network. One of them is respondent #20. His buyer (resp. # 12) just gives him pictures from which he makes samples, gives demonstrations and trains his own subcontractors.

As building capacity of subcontractors is a painstaking and risky process, exporters work with trusted subcontractors and retain complex sampling, assembling and finishing activities in-house. They build the capacity of their staff through training and bonuses. As resp. #14 notes: '*Most artisans work for me for a long period of time.(…) It is difficult to train people, so it is better to keep on working together'.* And respondent #3 states: '*5 workers I trained really well. I also give them an opportunity to express themselves. In the west, designers give detailed specification to their workers. I just give an idea and design, and workers can add ideas that fit in better with their technique. We are a team. I know the technique, but I can't really do it. They have 15 years of experience.*

Despite these strategies to transform firms, the fundamental problem is that subcontractors have low staff capabilities. It explains why no firm has been able to manage very large or complex orders. Large orders were cancelled and opportunities were lost. As respondent #1 expresses*: 'I actually turned down an order of KLM. They gave me a hundred pieces of models and asked me to produce at minimum size of a hundred pieces every month. They asked me to make samples in 40*

[10] Single regression analysis with assimilation as independent variable and innovation as dependent variable: α=0.000; β=0.360; R^2=0.355 model is tested on assumptions, no outliers with a standard deviation above 3.

days. I came back from the trade show, wooww what a dream to have this potential order. I went to firm X but the owner smiled and said they can only make 10 pieces every month.Nobody could produce larger quantities. I didn't know what to say, I just kept silent for few weeks, until the day I should deliver the samples, I sent a fax to KLM purchasing manager to say that I have to come to the reality that we could not supply the quantity because we do everything hand-made and then I returned all the samples".

Another constraint is limited management capacity. Respondent #16, a medium-sized firm, expresses: '*I want to develop other businesses, but I cannot leave. There would be no character in the design and business. A silver smith that worked for me once did something dishonest. Se he had to leave and he joined another company. He told them that he was the creative person. But it did not work, and he lost this job as well.*' Firms are aware of their small base to manage innovation and production networks. Respondent #9 for instance has taken action to strengthen the management capacity: *My management team is not balanced at the moment. We need a good management team. This is very important. A re-organisation process is going on now.* Other organizations have also employed high educated staff in order to improve their management capacity.

Exploitation

Exploitation requires balanced dynamic capabilities to ensure that new products are marketed well at the right price, based on efficient production processes (Dutrinet 2007). Firms are considered able to balance capabilities – and hence able to exploit knowledge – if they innovate products, processes and markets equally well. This ability has a large and significant impact on innovation. It explains 43.5% of all variation in innovation among firms (α=0.000; β=1.605; R^2=0.435).

Impact of absorptive capacity

To better appreciate the impact of absorptive capacity, the steps are combined into one indicator with equal weighting for each step. Transformation is not included, as it does not explain differences in innovation. Absorptive capacity computes the following indicators and their weight:

*AC = {[(T+L)/4 + (S+ D+DS +CD)/8] + [B]}*2.5*

AC=Absorptive Capacity; T=Travel dummy; L=language dummy; S=Staff Training dummy; D=number of departments dummy; DS= discuss with staff dummy; CD=capacity of designers dummy; B= capability to balance innovation dummy.

T he first *[]* stands for potential absorptive capacity and the second for realized absorptive capacity. Both score one point. The total is multiplied by 2.5 in order to develop a likert scale. The computed variable is internally reliable, as the indicators significantly associate (Tendall's tau-b test: T^b=.345, α=0.000).

Absorptive capacity strongly impacts on innovation, explaining 54% of the variation among firms[11]. It confirms that variation in absorptive capacity of firms in emerging economies explains variations in innovation levels.

A subsequent question is what matters most: potential absorptive capacity or realized absorptive capacity? Both have a significant and positive impact on innovation, but the impact of realized absorptive capacity is much larger[12]. The ability to balance product, process and market innovation is the most important aspect of absorptive capacity. Balanced absorptive capacity

[11] Linear regression analysis of absorptive capacity and innovation level (dependent variable): α.=0.000; β of value chain=0.446; constant=2.294 (Likert scale); R^2=0.544, , N=92, no outliers beyond 3 standard deviation.
[12] Multiple regression analysis:, α=0,000, $\beta_{potential}$ = 0.254, $\beta_{realized}$ = 1,207, R^2=0.540.

indicates mature dynamic capabilities that are required in volatile markets (Dutrinet 2007. Teece 2007). Slightly less than 20% of all firms are mature and most of them (81%) are exporters.

Determinants of absorptive capacity

Determinants include entrepreneurship and firm attributes. The importance of entrepreneurship was tested in a stepwise multiple regression analysis (table 11). Based on the regression, entrepreneurship does indeed explain about 44% of the variation in absorptive capacity, whereby only education (dummies) and the previous position (dummies) are significant indicators. As expected, higher educated have more absorptive capacity then lower educated. What is unexpected is that working experience outside the sector has a positive effect on absorptive capacity. This suggests that other experiences open up the perspective of entrepreneurs. Entrepreneurial characteristics such as gender and willingness to gamble have no significant impact on absorptive capacity. Women have considerably more absorptive capacity then men (60% more), but this is caused by a higher education level and a more relevant previous position.

Table 11: impact of characteristics of enterpreneurs and firms on absorptive capacity

Entrepreneur level indicators	Score	Firm level indicators	Score
R^2	0.430	R^2	0.499
α (ANOVA significance)	0.000	α (ANOVA significance)	0.000
B^0 Constant	0.313	B^0 Constant	-0.007
B^1 University dummy	1.953	B^1 Role in value chain (nominal)	0.554
B^2 Diploma dummy	2,175	B^2 Staff number	0.006
B^3 Secondary school completed dummy	0,822		
B^4 Other position	0,972		

Insignificant entrepreneur level variables: age, willingness to take risks, gender, no other position, worked in craft firm, primary school unfinished, primary school finished, secondary not complete, vocational.
Insignificant firm level variables: ownership, age, combine material, staff of subcontractors, annual turn-over.

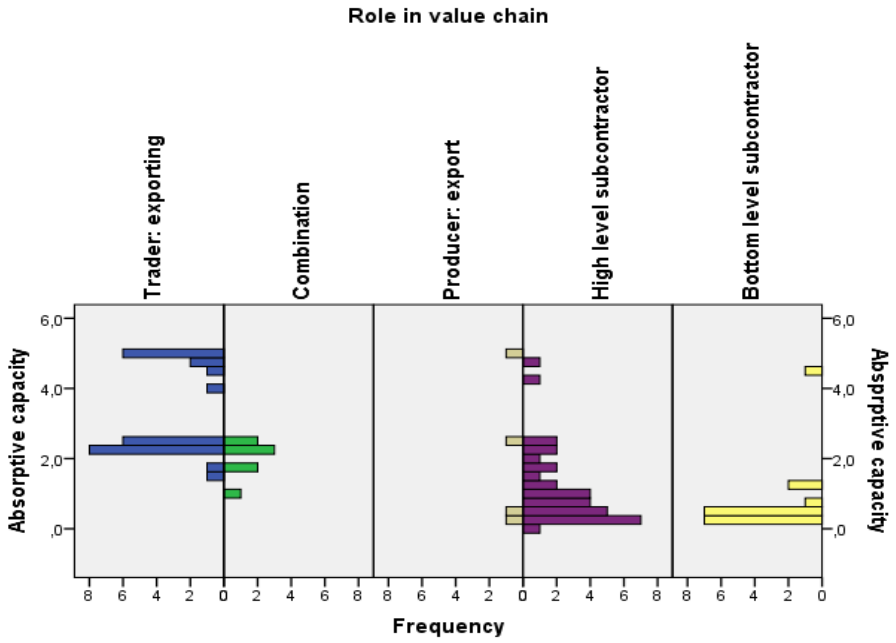
Willingness to take risks is not a significant indicator, as all entrepreneurs are at least moderately willing to take risks. Some very innovative firm consider themselves to be moderately risk taking, as they first study the market in order to reduce their risk. Respondent #25, a micro-scale subcontractor, illustrates that willingness to take risk has enabled his firm to survive when competitors went bankrupt: *"I have asked every shops to accept samples from me [note: they only pay after selling]. When the shops get orders I expect them to order from me. I am lucky because I have no competitors anymore (…). Other firms don't give samples to shops and usually complain about late payment from shop keepers. But it does not a matter for me. I have my own strategy, I sell gradually. When I deliver samples to shops, I have already prepared other samples. I am always sure that when I come back 3 months later, there will be orders for me because my products are already sold.'* The example illustrates that in a process of creative destruction firms that take risk and innovate take over market share from those who don't.

Firm attributes matter as well. In a multiple regression analysis, the only significant indicators explaining absorptive capacity are the role of the firm in the value chain and staff number (table 11). They explain 50% of the variation in absorptive capacity. The impact of staff number is however marginal (β=0.006). The level of absorptive capacity differs significantly between exporters, high level subcontractors and low level subcontractors, whereby a group of exporters has a particularly high absorptive capacity[13] (see figure 4). This group of 12 exporters (both exporters and subcontractors) is best able to absorb the latest knowledge from abroad. Other

[13] Tenballs tau-c test: T^c=10,458, α=0.000, N=89.

indicators, such as ownership, turn-over, age of the firm and number of workers in subcontractors have no significant impact.

Figure 4: absorptive capacity (likert scale) and the role of firms in the value chain



The process of building absorptive capability

Absorptive capacity of firms has increased tremendously the past two decades. This is caused by the entrance of new firms and incremental learning of existing firms. Firms established by high educated entrepreneurs with working experience in other sectors are the engine of local innovation processes. They do not only constantly transform routines within their own firm, but also transform their subcontractors. New firms have entered the sector and introduced innovations. These are firms with high absorptive capacity, operating as exporters or as specialized subcontractors[14]. Firms that traditionally operate in the sector were unable to absorb knowledge from global value chains and local innovation systems. As the more successful firms that existed at the time, now operate as subcontractors, the low level of absorptive capacity and innovation of subcontractors serves as a proxy. An addition problem of traditional firms is that they faced a large knowledge gap with new technologies abroad (Acs and Plumer 2005; Carlsson 2009, Sternberg and Muller 2005). For these firms to appreciate dynamic and fashion oriented market demands, quality requirements and other critical success factors of products in global markets is difficult, as their local clientele does not require those. Without speaking English, travelling, management capacity and other aspects of absorptive capacity, it is highly unlikely that traditional firms could bring the level of innovation that has been achieved. Only the new entrances operating in export markets could introduce that level of innovation and manage the transformation of the sector. Respondent # 11 reports:

> *'I am happy now seeing young people involved. Displays and designs and exhibitions improved a lot. In the past, the things I liked were always made by westerners. But now the westerner is being pushed to the corner. It is because of education. They are not going to industrial look, but keep in Indonesian style. That you did not see 5 years ago.'*

[14] Wengen et al (2006) also note that new SME's are more likely to export. This changes industrial structures.

Absorptive capacity does not only increase due to the entrance of new firms, but also grows incrementally. This is a complex and little understood process (Dutrinet 2004 and 2007; Teece 2007). The capacity of a firm is embedded in its organizational structure, people and network (local innovation system and global value chains). The networks are discussed elsewhere. Regarding organizational structure, especially exporters have improved their absorptive capacity. Exporters have set up departments and have employed high educated staff in order to manage both production and innovation capacity of their value chain. Exporters have delegated a part of value chain management to top level subcontractors, but this capacity is primarily vested in the entrepreneur of the firm, not in its organizational structure. Only a few subcontractors have established formal organizational structures.

The capacity of people has improved through three strategies:

- Training: 63% of all firms send their entrepreneur and/or staff to training, often provided by the government in association with university staff and associations. In addition, many entrepreneurs train their own staff, as they are better aware of specific trends and technologies than training providers. Training takes place on a wide range of topics, indicating that the sector moves forward in a balanced manner (see table 12).
- Human resource development: 46% of all firms report a large increase in quality of staff, 49% a moderate increase and 5% no increase. This increase is confirmed by the Centre of Handicrafts and Batik.
- Learning-by-doing is an important intrinsic process. All firms make mistakes when they start exporting and as a result loose income. Reported mistakes include late delivery, products broken in transport, low quality or not delivered to specification. The refusal of orders and payment by clients, their explanations and in some cases their support in overcoming these challenges, provide learning opportunities and processes of constructive destruction. Firms that survive and prosper have learned and are able to deliver high quality products up to standards. Firms have also learned from unfair practices of global buyers. Respondents #10 and 27, for instance, produced for a client who did not pay and subsequently installed a new routine to control clients first.

The combined process of entrants with high absorptive capacity and incremental improvements has resulted in an increasing level of absorptive capacity in the sector. This capacity is embedded within people, firms and their network. It creates untradeable externalities. Other locations that want to enter the market can also stimulate new firms to enter the sector, but absorptive capacity can't easily be copied or replaced.

Table 12: percentage of entrepreneurs and staff trained

	Entrepreneur	Staff
Product design	35	26
Marketing	40	23
Management	25	22
Technologies	14	10
Other (computer training, etc)	12	12

7. Global Value Chains

This section analyses whether the embedding of firms in value chains, modes of governance and other governance issues explain variation in innovation and why.

Embedding in global value chains

All firms operate within the boundary of global value chains and hence all firms benefit from its sector- and market-specific knowledge. Variations may arise based on the role in the global value chain and the intensity of contact with global buyers. The role in value chain matters significantly: exporters are significantly more innovative than subcontractors (α=0.000, β=0.417). Knowledge flows down the chain from global buyers to exporters to subcontractors. The common process is that global buyers offer knowledge on market trends, after which exporters and subcontractors develop a range of sample products. Buyers select (a) sample(s), demand further modification or move elsewhere. If they buy a product, they often demand exclusivity of the design. More creative exporters offer sample products out of the normal scope of global buyers, but this is risky for both parties and hence relatively rare. Such radically new products are normally shown at exhibitions, competitions and trade fairs. They potentially open up new market avenues. Exporters learn most from new clients, whom may demand different designs and standards and from global buyers that demand high standards. Selling to top level buyers such as Trade and Barrel or Zara Homes is seen as a quality stamp. Respondent # 5 describes knowledge interaction, upgrading support and learning by doing of global buyers:

> *Buyers are the most important partners for us, because if we produce what they like we will get orders. They know the market demand. If buyers come here they give us direction. We sit and discuss the collection of 2013. The theme is like this…. They also help in improving quality. They have an agent in Jakarta for technical auditing. He visits us annually. He teaches us how to make a production chart and to keep our tools in a special place. He tells us we have to use masks and that people who spray need to drink milk every week. We have 10 people that spray. (…) If we have a problem we will contact them. Then we go there or they come and we discuss the problem. Problem is mostly fungus, wood is cracking, coloring is fading or cracking. Then they ask a company to offer a seminar. And we discuss together. (…) If we are too late then the order has to be sent by air freight, we will receive a discounted price or the order is canceled. And our reputation…. 5 years ago, we failed in deliver on time. It happened twice that we had to air freight.*

Firms are not equally embedded within global value chain. Some exporters have more intense contact with global buyers than others. The intensity of contact however does not significantly impact on the innovativeness of exporters (regression analysis: α=0,552) and has a minor, but unexpectedly negative impact on subcontractors (α=0,04; β=-0,158; r^2=0.077). The latter may be caused by the fact that subcontractors that don't have a strong contact with exporters – and hence are not firmly embedded in global value chains – try to obtain knowledge from global buyers directly.

Mode of governance

The question is whether the mode of governance explains variation in innovation and why. Gereffi (2005) expresses vividly that modes of governance have a deterministic impact on innovation. In the case study, 16% of all firms operate in a captive value chain, 59% in a relational and 25% in a modular chain. In a multiple regression analysis, firms in modular chains are significantly more innovative than others, although the model only explains 5% of the variance in innovation[15].

[15] Stepwise multiple regression analysis: α= 0.044, β of a modular chain dummy =0.510; r2=0.045. Excluded variables: relational value chain dummy (α=0.132, β=0.217; captive value chain dummy

Operating in a captive chain has a negative, but insignificant impact on innovation and operating in a relational chain a positive but insignificant impact. Contrary to expectation, the impact of operating in a captive value chains on innovation is thus insignificant. To appreciate the outcome, a description of innovation processes is given for each mode of governance based on in-depth qualitative analysis.

Captive value chains

In captive value chains, contact between buyers and firms is strong and consolidated. Buyers are far more likely to furnish suppliers with their design, material and equipment than in relational or modular value chains. Buyers are also more likely to know the profit margin of suppliers[16]. This is in line with theory, indicating that the measure of captive value chains is valid (Gereffi 2005, Kaplinsky and Morris 2000).

Captive value chains in home accessories do provide opportunities to innovate. Most exporters that have operated in captive chains produced for IKEA. I will focus on these and highlight differences with other chains. This approach enables me to specifically assess the strategies of the global buyer. Captive relationships with IKEA lasted two to five years (longer for other chains). The firms producing for IKEA (Resp. # 7, 10, 18) were large firms at the time, with many subcontractors. Before they were allowed to produce for IKEA, IKEA conducted intense audits. Standards of production, quality, environment and labor were audited. IKEA audited the firm, their subcontractors, suppliers, transporters and all others involved in the value chain. They studied the accounts and production processes. '*When they were done'*, noted respondent 18, '*they knew more about my firm then I did. It was no longer my firm, but I learned a lot'*.

This set the scene for intense collaboration, resulting in deep innovation processes. IKEA staff located in Jakarta visited regularly to control quality, but also to support innovation processes. If necessary they visited weekly or stayed for extended periods of time. The operational capability increased tremendously. Product quality improved, labor specialization was introduced, firms handled very large orders, generally five times as large as they were used to, quality control systems improved, just as labor and environmental standards. Respondent #10 noted: '*IKEA learned me to negotiate directly with suppliers. I started ordering whole trucks of glue at one go, which saved costs'*.

Ivarsson and Alvstrom (2010) consider the IKEA value chain to be developmental, where innovation is an integral part of the process. The chain is not considered to be captive, as suppliers are free to supply other buyers and benefit from the quality stamp of IKEA. Based on interviews with suppliers that ended their relationship with IKEA, this conclusion needs qualification. First, all suppliers were that busy supplying for IKEA that they had difficulty producing for others. IKEA wanted production to double annually. Also in the study of Ivarsson (2010) suppliers mainly sold to IKEA. Second, IKEA annually reduces its price by 7% in order to stimulate efficiency gains and only pays three months after delivery. As a result, '*a disproportionally large share of cost-savings goes to IKEA*' (Ivarsson and Alvstrom 2010: 18). By the end of the two years, the three firms that I interviewed had innovated but had not made financial gains comparable to other firms in Yogyakarta. Other firms made profit margins reported to be as high as 40% to 100% , whereas margins of IKEA suppliers were just enough to pay interest rates. Furthermore, all innovations were decided by IKEA, creating an unbalance. They were directed at cost reduction in low priced, mass production. Resp. #18, who made baskets of natural fiber,

---

(α=0.132, β=-0.161). The analysis includes both global and local chains, as numbers are too small to separate the two.

[16] V-Cramer: captive chain (dummy) with 'client gives design': V = 0.347; with 'client gives material': V= .379; with 'client gives equipment: V'=0,322; with 'client knows profit' V= 0.442. All significant at 0.05.

noted: '*Once I stopped working for IKEA I got color in my life. Literally. I had only produced low cost baskets in natural fibers for IKEA. I now realized that I can color my products and fetch higher prices. My profit margins went up by 20%*'. Respondent # 7 sold to another client while producing for IKEA and noted: '*The reason we stopped producing for IKEA was that a buyer – Habitat - complaint about our quality. I had a claim from Habitat. Our workers were thinking that the low IKEA quality is viable for all our clients. I then decided that I'd rather focus on better quality'*. The focus on low cost products thus results in a downgrading of the sector, a race to the bottom (Kaplinsky 2000).

Not only the mode of governance but also strategies of buyers determine opportunities to innovate (Gereffi 2005). Strategies of IKEA have indeed influenced opportunities. IKEA initially contributed to the innovation process, but subsequent changes in value chain strategies resulted in the termination of contracts. The past decade IKEA decided to gain more control on environmental and labor standards, locate suppliers closer to markets, and cut out intermediate wholesalers. IKEA therefore reduced the number of suppliers, shortened value chains, increased direct control systems and relocated production (Ivarsson and Alvstram 2010; IKEA 2008, 2010, own data). Firms in Yogyakarta didn't fit the bill, as subcontracting makes it hard to control standards, Indonesia is not a main market and the relatively small exporters do work through intermediate wholesalers. IKEA established a new production centre in Indonesia, which was located in Solo, about 2 hours drive from Yogyakarta. The reason was that exporters in Yogyakarta were unwilling to operate under the conditions set by IKEA. They were able to move to a relational value chain.

Relational value chains

Most value chains are relational in this industry. Suppliers have vested interest in reciprocal knowledge interactions with buyers, as they require tacit and detailed market knowledge. It takes about 3 years from a first latent contact at a trade fair to a large order. During those years there is email exchange and (bi) annual meetings at trade fairs or other meeting places. Once orders start a relationship of trust and reciprocity develops. Quality control reduces and tacit knowledge is shared more easily. Respondent #7 reports: *Some clients I have for a long time. I have a buyer from Canada since 1996. Now he also has a wife from here. I follow the wife and even babysit the son. At the moment there is no business from him, but they stay in my house. The same happens with clients from Italy, Spain, etc.*

In relational value chains knowledge is exchanged in transactions and social interactions. Transactions provide ample opportunity to learn by doing. Typically, a buyer sends a detailed product specification or design concept, after which exporters prepare sample product(s). The buyer then selects. An alternative approach is that the buyer sends design concepts to a range of exporters, whom design and present sample products. The market signal which designs are sold at what price provides a very strong learning signal. Even stronger is the signal when a buyer rejects an order due to low quality, later delivery or otherwise. Due to the financial and reputational loss accrued, firms will work very hard to prevent a repetition.

Interactions provide additional knowledge, as buyers offer more detailed and specific knowledge in a relationship based on trust and reciprocity. Exporters therefore visit their main buyers, invite them at home, organize holidays in Indonesia, etcetera. A global buyer living in Yogyakarta, explains why trust is important for innovation: '*It is all about innovation. There is a lot of competition. Therefore, your whole range of products must be interesting. I offer every natural stone from Indonesia. If I offer 5 new products, one will survive in the markets. But I must offer 5 products. These I develop with firms that I trust'*. His main exporter, respondent #53 adds: '*He is the most active customer asking for new samples. Every month he asks for two or three samples. It really helps us to innovate*'. The importer visits the exporter weekly, offering feedback and control

on design, quality and price. Not all relations are as strong as described above. Most operate from a physical distance and provide less opportunity for tacit knowledge sharing.

Modular value chain

Many firms aim to establish their brand name in Indonesia. It is an emerging market, where technologies and industrial structures are not yet set. Hence even small producers are able to sell products in their name, sometimes selling from the trunk of their car or on open markets. Many large exporters explore the quickly growing local market and actively promote and advertise their brand. Design competitions play an important role in gaining brand reputation. However, to be regarded as a modular player, a firm must also offer their own brand internationally. A few exporters and even a few subcontractors with innovative designs do so at times. This is primarily related to selling unique pieces of art in the name of the artist. It is thus not a modular chain, which assumes that a firm makes a share (a module) of a fragmented production process, but it similarly allows the producer to set standards and designs. This global recognition of product design explains the significantly higher level of innovation.

Other governance issues: international standards

Company and public standards impact on innovation. As they impact on all firms, they don't explain variation in the level of innovation, but as they do steer innovation processes it is worthwhile to briefly acknowledge them. Respondent # 2 notes: *Years ago it was easy to export. Now we are faced with many standards. These are not easy to meet.* The respondent mentions how buyers increasingly specify and check labor conditions. It forces exporters to improve labor standards throughout the value chain. This is especially complex for subcontractors, whom often pay workers piece-rates. For some buyers, such as IKEA and the Body Shop, limited control of labor and environmental standards within the value chain provide reasons to adapt their value chain management or even leave Yogyakarta.

Environmental regulations in Europe and the USA steer innovation towards environmental-friendly production. Firms introduce environmental-friendly paint, glue and wood treatment, sometimes jointly developed with their suppliers. At times the standards steer innovation into an unsustainable direction. For instance, due to the rapid growth in demand for environmental-friendly used wood, many firms are looking for used wood. This also does not crack, easing production processes and quality control. There was a lot of used wood after the earth quake, but now some firms even purchase old houses in order to acquire used wood. Respondent #3 explains how new European regulations related to electricity and wood impact on his European market. New regulation demands a separate certification for each designed lamp and wooden product. As he produces small tailor-made quantities, just like other firms in Yogyakarta, this becomes too expensive. At the moment the regulation is only enforced in Germany, but he is considering new markets and products in case other European countries tack along. Similar problems arise in the export of snake skin (resp. # 18) or rattan products (resp. # 10 and 13). The increasing cost of certification and procedures related to international standards may therefore in time force firms to move towards mass production.

8. Local Innovation Systems

This section analyses the impact of local knowledge interactions and clusters on innovation. It also analyses the governance setting, social embedding and context. Local innovation systems in Indonesia are relatively weak, but Yogyakarta houses some of the stronger systems in metal, food and home accessories (Taufik 2007).

The impact of knowledge interactions on innovation

The first question is whether knowledge interaction within the boundary of the local innovation system enables all firms to acquire knowledge more easily. Interactions and knowledge spill over within the local value chain do enable all firms to innovate, whereas interaction with non-firm actors is much weaker (figure 3, Ismalina 2011, EU 2008). Knowledge interaction is strongest between exporters and subcontractors. Exporters discuss new knowledge with their subcontractors, resulting in reciprocal knowledge exchange (table 13). Joint research in informal brainstorm sessions between exporters and subcontractors is common as well, if only because exporters want to be sure that subcontractors can produce their designs. There is also strong knowledge spill over across firms. As respondent 5, an exporter, noted: *if I want to know what is happening, I talk to my subcontractors. They know what my competitors are doing.* The respondent brought us to one of his subcontractors who was at the time producing for another exporter. This included labeling, with the name of the buyer for all visitors to see. Keeping design and clients a secret is a dream in such an environment. However, joint activities of exporters – where innovative firms join forces - at a horizontal level however are far apart. Exporters hardly ever jointly design new products. There are only two cases of joint R&D activities. The first is KREO, an association of 8 young and dynamic designers working for various exporters (source: resp. #3). They share designs and inform each other when a buyer wants them to produce a product of a competitor. By sharing product designs they are not only successful commercially, but also win many design competitions. In 2011, KREO won 6 of the 15 design prices in Indonesia. Indonesian designers, with an contemporary but recognizable Indonesian style, are becoming a more important source of product innovation (resp. # 11). The second is APIKRI, a fair trade foundation of small firms (see also Shima et al 2006). It operates as an exporter, but in addition offers joint product design and community development services. APIKRI has a team of two designers and regularly invites foreign designers to work with subcontractors. Their subcontractors, however, notice no difference in innovation between APIKRI and commercial exporters. But they do notice that the market segment is different. In conclusion: reciprocal knowledge exchange between firms enables all firms to acquire knowledge, but reciprocal knowledge exchange among exporters and between firms-non firms is weaker, which limits the likely impact of local innovation systems.

The second question is whether firms with more intensive local knowledge interactions have higher levels of innovation. The impact of firm-firm interaction is measured by the importance of exporters as a source of innovation. For the impact of non-firm actors, a new indicator was computed. The importance that firms attach to contact with all actors outside the value chain correlates significantly, indicating that some firms have developed stronger interactions with non-firm actors than others. But there is no correlation between importance attached to interaction with firms and non-firm actors (annex 3, table 6). A multiple regression analysis was conducted to assess the importance of local interactions on innovation. The model explains only 14% of variation in innovation (r^2=0.137), indicating that the embedding within the local innovation system does not drive innovation processes. The only significant factor that explains innovation is the importance of contact with exporters (α=0.000, β=-0.223). Having contact with exporters thus makes firms less innovative. As we will see later, this is explained by a difference in absorptive capacity between exporters and subcontractors. Being better linked to non-firm actors has no significant bearing on innovation.

Embedding has a geographical connotation, which is important as tacit knowledge flows most easily within an economic space. Non-firm actors of the local innovation system are based in Yogyakarta city, exporters are located in the peri-urban area (at the border of Yogyakarta and Bantul), top level subcontractors are located in Bantul, but still within the same economic space, and low level subcontractors are based in traditional villages and clusters, some of which happen

to be within the study area and others outside. The location of exporters is no coincidence: it allows high educated entrepreneurs to live in the attractive living environment of Yogyakarta and remain connected to global value chains and non-firm actors and at the same time it enables access to subcontractors out of town. It links Jacob's externalities of Yogyakarta to locational externalities of Bantul.

Table 13: with whom do you discuss innovation?

	Exporter	Subcontractor	Combination	Total
Staff	83,3%	56,1%	70,0%	66,0%
Buyers	76,7%	69,6%	80,0%	72,9%
Subcontractors	43,3%	8,8%	30,0%	21,6%
Other firms	9,7%	8,8%	9,1%	9,1%
Government	6,5%	0,0%	9,1%	3,0%
Universities	6,5%	0,0%	9,1%	3,0%
Business ssociations	10,0%	0,0%	0,0%	3,1%
Family and friends	10,7%	42,1%	30,0%	31,6%

The impact of poverty-driven clusters on innovation

Indonesia has the astounding number of 9,800 units of small industry clusters, mostly in central Java and Yogyakarta (540 in Yogyakarta, Tambunan 2006b). These are traditional activities of local communities where production has long been advancing. They specialize in products of one specific material, generally sourced from within the cluster and produced by skilled workers from the village itself. These traditional clusters have a deep social embedding, with locally rooted value systems and strong ties of association. Since the 1950s, government has sourced its support through cluster associations, resulting in a proliferation of associations (Brata 2011). In Yogyakarta home accessories, each cluster houses at least 1 association, increasing up to 5 in Katogede silver cluster. They function as business association, rotating saving groups and/or cooperatives. Their membership totals at least 850 firms. Some clusters, especially in silver, wood carving and leather are known to be dynamic, innovative and export oriented.

The importance of clustering in economic development has changed radically the past decades for various reasons. First, many firms within clusters are struggling to maintain their profit margins, as they have been unable to keep up with international market trends (UNIDO 1998). Second, an increasing number of exporters and newcomers have entered clusters, which has negatively affected the deep social embedding that characterizes these clusters. Third many clusters have slowly changed from production centers to tourist destinations, increasingly banking on showrooms, hotels and restaurants (Ismalina 2011). And fourth, the reducing amount of production still taking place within clusters has been embedded within global value chains operating across traditional clusters (Tambunan 2006b).

In this study clustering correlates significantly and negatively with innovation. The relationship is linear (α= 0.017, β = -0.476, r^2=0.0489). This is explained by the fact that clusters house a large share of bottom-end subcontractors and small firms, with lower levels of absorptive capacity. Poverty-driven clusters are inserted at the bottom of global value chains. If the regression is controlled for absorptive capacity and position in value chain, then poverty-driven clustering no longer has a significant impact on innovation et al (see next section). Tambunan (2006b) reports other studies in Indonesia where clustering has no significant impact either.

This conclusion is in line with existing literature on poverty-driven and somewhat more dynamic clusters in emerging economies (see for an overview Knorringa and Meyer-Stamer 1998). But it has important policy implications. Indonesia has supported clusters since the 1950s. It offers an impressive range of policies to support clusters as engines of growth and innovation. This includes 64 different policy instruments, applied in 594 projects. In total, 9,127 clusters have been supported up to the year 2000. Many policies aim to improve the capacity of firms operating in clusters. As firms in clusters have a low level of absorptive capacity, this is a difficult task. Government support does however result in more innovation of firms located within clusters (α=0.008, β=0.234, r^2=0,1981), while cluster associations have no significant impact (α=0.450, β=0.143). Channeling support through cluster associations is thus ineffective under the current circumstances. However, contrary to Ismalina (2011), Tambunan and Supratikno (2004) and Tambunan (2006b), the government support offered is effective. On the other hand, the policies do not target the movers and shakers of innovation processes, which limit impact. A new dynamic production network arises across material and space, driven by innovative exporters. This industrial network comprises a larger area from Yogyakarta city, to Bantul and Manding, stretching to neighboring cities for low cost production and/or access to raw material. There is no support offered at this level.

Governance

Governance of the local innovation system explains weak firm-non firm interactions and hence provides an explanation for its insignificant impact on innovation. Explanatory factors include capacity constraints of non-firm actors, absence of research incentives, weak rules of appropriation and standard setting. The analysis is based on qualitative data.

Capacity of non-firm actors and research incentives

Interaction with non-firm actors plays a secondary role in innovation. Government and finance institutes are the most important non-firm actors, followed by associations and NGO's. This is in line with studies of Ismiralda (2011), Brata (2009, 2011) and EU (2008). The limited role of non-firm actors is explained by capacity constraints and a lack of research incentives.

Government. Government offers knowledge on international standards, laws and regulations, offers subsidies for trade fairs, organizes an annual trade fair in Jakarta and avails technologies and research on new designs. Knowledge is transmitted in a codified form (emails, letters, newsletters) and in a tacit form (training, trade fairs, associations and extension services). For all modes of knowledge geographical and cognitive proximity matters, as knowledge is only shared within the jurisdiction of local government and only to those in contact with government and associations. As the production network cuts across three local governments within the Yogyakarta metropolitan area, this at times creates differences in knowledge dissemination between locations (differences in amount and field of training, subsidies etc). Research and access to technology is offered by the Bureau of Business and Technology and the Association of Handicrafts and Batik. The association designs new environmental-friendly production techniques, offers training and entrepreneurship development. The association houses an impressive amount of machines and prototype production processes developed by themselves. Though not all firms attach great importance to the government, all firms receive knowledge, creating barriers of entry. Due to the increasing importance of standards, laws and regulations in steering innovation processes this knowledge is important.

However, the role of government is widely questioned and criticized. First, they are not seen as an active partner when innovation is discussed (see table 13). They do provide useful knowledge, but lack up-to-date and specific knowledge on global markets, designs and production processes. Exporters therefore consider the Departments of Trade and Industry as not very capable in delivering training (resp. #3, 10, 11), bureaucratic (resp. #13) and inefficient (resp. #16). Second,

technologies offered by the technological centre are hardly used, as firms don't know about their existence and don't need them (Ismiralda 2011). As resp. #16 states: *After the earth quake, the government helped with Rp 1.1 bln to make a common facility for small firms. They build machines, but nobody uses them. (…) Nobody knows. This does not only happen in silver, but in all sectors.* The head of the Technology and Incubation Department of the Association of Handicrafts and Batik expresses the institute's vision on innovation: *Companies are not doing research. I am sorry, they are not research institutes. (..) We have a paternalistic culture. It is very difficult to push firms to grow.* The paternalistic and science-driven innovation process of the association colludes with buyer-driven innovation processes of firms.

Finance institutions. Finance is problematic, as global buyers pay at least half afterwards, sometimes three to six months after delivery. Exporters bridge the finances for themselves and their subcontractors. Most exporters have sufficient reserves, but some exporters find it impossible to innovate as they lack financial reserves and have difficulty obtaining credit. Letters of credit are hardly used, as exporters prefer a partial payment upfront. Micro credit, relevant for small subcontractors, is widely available and used. Firm need a letter of the head of village and collateral, but no formal title deed is required. However, small subcontractors are not using micro credit for innovation, but to pre-fund production (interviews at BDP Bank; resp. #23). Investing in innovation is considered too risky.

Business associations. Business associations are not considered important for innovation processes by firms. There are four associations at the metropolitan level plus a large number of cluster associations (discussed under clusters). The associations are ASMINDO, which focuses on furniture and home accessories, ASEPHI, which focuses on small firms in batik and handicrafts, the Council of Handicrafts, which aims to build capacity of small handicraft firms and the Chamber of Commerce. Members of the associations meet (bi)monthly, creating opportunities to share tacit knowledge. All maintain close contact with government. The head of ASEPHI for instance is the daughter of the Sultan. There are direct links with the Minister of Trade and Industry. The Council of Handicraft is a public-private partnership, housed within the local government. The leader of the council is the wife of the vice president of Indonesia. All associations primarily train and support small firms. Associations are a government tool of local economic development policy (Tambunan 2006a). Only the Chamber of Commerce has a broader perspective. It offers access to finance and markets in addition to capacity building. But the chamber only has 5 employees, servicing thousands of firms in Yogyakarta province.

Business associations are also widely criticized. They are seen as only benefitting its active members, the elite, due to collusion of interests between active members and governments (Indarti 2011, Shima 2002, resp. #6, 8, 9, 13, 14, 25, 32, expert interviews), being only relevant for small subcontractors (resp. #2) or just relevant to obtain subsidies for trade fairs (resp. #10, 11). Government contact is important in obtaining government orders to decorate offices or sell gifts, but not for innovation processes. They are, in short not offering a platform of firms to share knowledge and represent them, but primarily represent government policies. Their limited importance in innovation process is therefore understandable.

Knowledge institutes. The main knowledge institutes are universities, especially the institute of arts (ISI). Universities are debit to the quickly growing absorptive capacity of firms, as many staff graduated from one of the 70 universities. They are seen as too theoretical to directly benefit the sector, but all universities increasingly pay attention to entrepreneurship and community services. At ISI, students can choose between more artistic and more commercial art studies. But their role in innovation interactions is limited to teaching. There is no joint design development or innovation platform.

Business Development Services (BDS). BDS focuses on SME's and clusters, at the exclusion of exporters and value chains. According to respondents, exporters are primarily seen as exploitative and not as drivers of innovation processes. Value chain support is limited to organizing trade fairs in Jakarta and subsiding visits to trade fairs. International NGO's have partly but temporarily filled the gap. They offer value chain support to exporters, for instance by organizing training events, subsiding associations and subsiding environmental-friendly investments. They also play an important role in rebuilding the sector after the earth quake. However, their support is normative and time-bound. Respondent #12 for instance received coaching and training from CBI. At the time he produced for IKEA, but CBI convinced him that a captive value chain is risky. Just after moving away from IKEA, the earth quake destroyed his factory. He was unable to produce for new clients and lost his market share. As CBI only offers support for three years, they could no longer offer assistance either.

Rules of appropriation

Illegal copying is considered problematic by most firms, especially exporters (see table 14). Buyers sometimes misuse the situation. As resp. #10 notes: *Buyers ask us to make a design, which they give to our competitor at lower prices. We lose our investment in innovation, which easily adds up to 10 to 20%.* Such opportunistic behavior reduces trust and reciprocity and hence limits collective efficiency. However, weak rules of appropriation have ambiguous effects on the location innovation system. Illegal copying not only reduces trust and reciprocity, but also diffuses knowledge across firms at low transaction costs. 40% of all firms, especially exporters, respond to this risk by quickly designing new products causing a speeding up of innovation processes. Weak rules of appropriation thus reduce collective efficiencies, but also motivate individual firms and diffuse innovations (see also Dosi 2006).

Table 14: is copying a problem?

		Exporter N-31	Subcontractor N=57	Combination N=11
Is copying a problem	Yes	91%	67%	82%
	No	6%	25%	9%
	Don't know	3%	8%	9%

Standard setting

The sector has a significant number of quality control institutes, as well as clear quality standards related to product safety, environment and labor. However, Indonesia mainly follows international standards. Innovation is therefore primarily driven by international standards and not by local standards.

Social embedding

Social embedding explains reciprocal knowledge exchange between firms and hence explains why firm-firm interactions do impact significantly on innovation. It also accounts for a high level of innovation across all firms.

Respondent #19 notes: *'I started working in firm (resp. #7) as supervisor. (..) While I was working, I asked permission to establish my own firm. I still consider myself his worker, but at home I am the boss.'* And later he adds: *'Resp. #7 does not give me many orders anymore. But he is the most creative. He is the master. Many of my designs* (for other clients) *are inspired by him. I have many meetings with him to discuss new designs. I get a lot of motivation from this'.* These strong social ties result in deep innovation support, with exporters acting as value chain managers. This is illustrated by the relationship between resp. #4 and its main subcontractor resp. #22. The subcontractor has a special position: the owner is one of the very few people in the Katogede

silver cluster able to make filigree. He originates from Wanosari, a city 40 km away, subcontracts about half of his orders to family in Wonosari, acting as an intermediary. He has been an important asset for resp. #4 in changing its production from carved silver to filigree. As the quality control officer of resp.#4 expresses: '*There are not many subcontractors that are loyal and can produce class A silverware'*. When we asked how he is awarded for his loyalty and intermediate role the answer is: *'He is awarded by ease of payment and ease of lending money. If he needs money for children's education, he can easily borrow it. Many of the other suppliers cheat. They offer lower quality and sell to other firms. The highest risk is that they just sell the raw material. Therefore, this subcontractor always gets priority when we give orders'*. All basic equipment and tools in the house of the subcontractor were sold to him by the exporter. The subcontractor has been able to significantly improve his income and innovate his products and processes.

Context

Improvements in the local context have more impact on the level of innovation than expected. The past two decades the business environment improved considerably. Ease of doing business improved, while the sector and Yogyakarta became more attractive for high educated business startups.

The past decades the Indonesian government has increasingly been able to create an enabling business environment. In the past, setting up a business in home accessories was not considered to be an option at al. The story of respondent #16, is exemplary: *I have a master in cartography at Gadja Mada University from 1980 and was the best graded student of my year. I wanted a government job, as everyone else, but was rejected twice because I lacked recommendation letters from high officials. This really upset me. I then started a company, as my father asked*'. He was the first university graduate starting a business, at least ten years before a host of other university graduates joined him. What changed?

The first change is that the ease of doing business improved. Yogyakarta Province offers the highest ease of doing business in Indonesia. The number of days to establish a business reduced from 151 in 2001 to 45 days in 2006. A one stop shop for business licenses was set up. Also credit facilities and taxation improved considerably, whereas affirmative action for entrepreneurship development continued. However, the ease of doing business still allows room for improvement (World Bank 2012).

A second and related change is that the image of home accessories as a backward, traditional sector changed due to higher profit margins, new export markets and policy support. The past five years politics in Indonesia has woken up to the economic, social and cultural opportunities of home accessories, with a range of policy initiatives, projects and road maps being developed. These were centered around the 'Indonesia Design Power' initiative in 2007 and 'Indonesia Creative Year 2009'. (Suharkomo 2008, Febrina 2009, Jakarta Post 2010b). Yogyakarta is one of the four trade hubs in home accessories in Indonesia (Jakarta Post 10b). It is a main cultural and educational centre in Indonesia and Indonesia's second biggest tourist destination next to Bali. Cultural industry, tourism and education are Yogyakarta's dominant industries, contributing 36% of GDP (constant value) in the province in 2002. Its vision is "to develop Yogyakarta Special Province towards the prime center of education, culture and tourism in 2020" Since decentralization laws in 1999, revised in 2004, Yogyakarta has increasingly been able to create public private partnerships, reduce corruption and support small firms and creative sectors such as home accessories (Shima et al 2006). These policies and policy actions have contributed to making home accessories a more acceptable sector for high educated startups.

In addition to these changes, Yogyakarta continues to offer the highest quality of life in Indonesia and one of the lowest GINI scores. This provides the 270,000 students in Yogyakarta with an

incentive to stay, even if salaries are considerably lower than in Jakarta or Bali. Being able to attract and retain the creative class by offering a high quality of life is a key asset of regions (Florida 2005). In combination with a more attractive sector and a better business environment, it helps understanding the establishment of highly innovative firms by highly educated in sectors such as IT, T-shirts, lady bags, home accessories and golf wear (Lewitschnik 2012, Pemba 2003).

Conclusion

The local innovation system and its context impact positively on innovation. Knowledge interactions are strong among firms due to the practice of subcontracting based on strong social ties. This positively impacts on the level of innovation. At the same time, the context improved considerably, which explains why high educated have entered the sector. But the impact of the local innovation system is constrained, as interactions between firms and non firms are weak due to inherent weaknesses of the governance system.

9. Modeling

The previous chapters have highlighted the independent and intermediate variables that significantly explain variety in innovation. Significant independent variables are global value chain (role; importance of global buyer; and mode of governance dummies), local innovation system (importance of exporters and government; dummy for being in or outside a cluster and for IPR protection strategies) and public sources. The intermediate variable is absorptive capacity. In a more elaborate model, the impact of firm and entrepreneurial characteristics will be included as well (size and ownership of firm; education level and previous position).

The regression model is as follows:

$$I = B_0 + B_1 * X_1 + \sum B_2 * X_2$$

I is innovation (measured on a Likert scale), B_0 is the constant, B is the partial regression coefficient, X_1 is the intermediate variable and X_2 are independent variables. The multiple regression analysis is run stepwise and has been tested on multicollinearity (Pearson correlations), linearity and normal distribution of outliers and residues. The robustness of the model was improved by removing the two largest outliers and trimming three outliers. Main results of the model are in table 16. The table offers variations of the main model, based on size, function and location of firms. The model for micro firms has problems with homoscedasticity and normal distribution of residues. For some variables the relationship appears not to be linear. It is caused by small numbers (n=22). In order not to affect the main model, this has not been adjusted, but as a result the data on the bottom-end subcontractors must be treated with caution. The main model explains 56% of the variety in innovation, rising to 62% in the elaborate model.

The model confirms absorptive capacity as intermediate variable. In the context of an emerging economy, where variation in absorptive capacity of firms is large, it explains variation in innovation among firms. In this case, it explains 56% of variation. The explanatory power of innovation interactions becomes insignificant in the model. If a firm has absorptive capacities, it does not significantly matter where they source knowledge from or how they fit into global value chains. Only for small firms, bottom-level subcontractors and firms in clusters, the role of absorptive capacity is slightly less deterministic. If they are aware of the importance of global buyers, this also improves innovation. For clusters, governments have a small direct effect on

innovativeness. It confirms the government policy, and its relative success, on clusters. In the extended model, only a previous position outside the sector positively impacts on innovation.

Firms with high absorptive capacity are considerably more innovative than other firms. They are primarily large exporters, whose entrepreneurs have a university degree (table 15). Firms with a medium level of absorptive capacity have a much lower innovation level than those with a high level, are smaller and more varied. Their internal differences in innovation are explained by patenting and attracting knowledge from local firms. Firms with low absorptive capacity operate more often in captive value chains and in poverty-driven clusters. They are smaller with a lower education level of the entrepreneur. For this group of firms, differences in innovation are primarily explained by their networking with local exporters. The more they bank on local exporters, the less innovative they are. The more they are aware of the importance of global buyers, on the other hand, the more innovative they are.

Table 15: characteristics of firms based on absorptive capacity

Characteristics		Absorptive capacity (Binned)		
		Low	Medium	High
Innovation	Mean level (likert scale)	2,6	3,1	4,4
Firm characteristics	Staff number (mean)	13	39	91
	Annual Turn Over (US$, average last 5 years)	$39,535	$436,886	$995,591
Entrepreneur characteristics	Age enterpreneur (mean)	39	41	42
	University education (dummy)	15%	63%	68%
Global Value Chain characteristics	Exporters (%)	0%	46%	79%
	Relational value chain (% of firms)	72%	64%	81%
	Modular value chains (%of firms)	10%	27%	15%
	Captive value chain (% of firms)	18%	9%	4%
Cluster	% located in traditional cluster	55%	31%	26%

Table 16: regression results

	Main model	Absoptive capacity			Position value chain			Cluster	Firm size			Extended model
		Low	Medium	High	Top end subcontractors	Bottom end subcontractors	Exporters	Firms located in cluster	Micro firms**	SME	Large firms	
Model summary												
R^2	.563	.358	.309		.457	.645	.365	.537	.490	0.530	0.456	0.622
F-value	104263	8981	6491		23598	16723	16069	16791	7676	23.662	12562	52690
Model significance	,000	.001	.005	.701	,000	.001	.000	.000	.005	0.000	0.003	0.000
Betas												
B_0 (Constant)	2,156	2,507	2,126		2,150	2.101	2,339	1.992	2.490	2,368	2,064	2,181
Absorptive capacity	0,452				0.545	0.305	0.418	0.271		0.428	0.487	0.424
GVC: global buyers		.158				,104			.110			
GVC: local firms		-.130	.248									
GVC: role in value chain (nominal)									-0.283			
LIS; Importance of government								.183				
IPR strategy: patents (dummy)*			2.526							1.562		
Prev. position: other (dummy)												0.407

**Patent is only for exporters and for medium and large sized firms.*

*** Model has problems with homoscedasticity and normal distribution of residues (see annex 3).*

All variables are in a Likert scale, except for dummies and firm- and entrepreneurial characteristics

10. Conclusions

This study aims to understand how exporting firms in home accessories in Yogyakarta innovate by absorbing knowledge from local innovation systems and global value chains. Embedding in local innovation systems and global value chains enable firms to acquire knowledge at the crossroad of both systems. It creates a head start in innovation processes. However, absorptive capacity is the only variable that significantly explains variation in innovation. Variety in innovation is not explained by the positioning of firms within local innovation system or global value chains, but solely by absorptive capacity. The firm's ability to acquire knowledge, assimilate it, transform production processes and exploit new knowledge is a precondition to benefit from interactive knowledge processes. Innovation is capacity centered, whereby enlarging absorptive capacity is the key to success. Absorptive capacity increases primarily when newcomers with high education levels and experiences in other sectors start new, medium-sized businesses. Absorptive capabilities that matter include language skills, travelling, a departmental structure, staff training, internal discussion and capacity of designers. Especially the ability to balance product, process and market innovation explains the level of innovation of firms. It indicates the maturity of absorptive capacity (Teece 2007, Dutrinet 2007).

Global value chains provide reciprocal knowledge exchange that drives innovation processes. But contrary to expectation, the mode of governance and strategies of global buyers do not significantly explain variation in the level of innovation. Firms are able to innovate in all value chains. More research is needed to better appreciate the conditions under which modes of governance and strategies do or do not matter.

The local innovation system also provides reciprocal knowledge exchange for all firms, but does not explain variation in innovation either. The local innovation system is characterized by strong knowledge interactions among firms, but weak firm-non firm interactions. Weak firm-non firm interactions can be explained by weak governance of the local innovation system. Reciprocal firm-firm interactions can be explained by the practice of subcontracting based on strong social ties. The local context, external to the local innovation system, has a significant bearing on innovation. The business environment and attractiveness of the sector for high educated improved considerably the past two decades, which explains why high educated entered the sector.

The study provides research and policy recommendations. The main research recommendation is to firmly include absorptive capacity and global value chains in future studies on innovation systems. Both fields of study provide powerful concepts in explaining innovation patterns, as well as tested indicators. Without absorptive capacity as intermediate variable, it is easy to conclude – wrongly – that local innovation systems and/or global value chains explain variations in innovation. The main policy recommendation is to establish policies that enlarge the share of local knowledge generation and exchange. Yogyakarta is known for its ability to produce innovative design, but most firms still bank on knowledge from abroad. It is priority to continue improving absorptive capacity by stimulating high educated to enter the sector, as newcomers tend to be most innovative. A larger share of innovative firms will reposition Yogyakarta within global value chains. It redirects attention to macro-economic stability, business environment, city attractiveness and venture capital. Despite significant improvements in these fields, improvements are still needed. At the same time, it is recommended to shift policy focus from clusters to local innovation systems. Especially the governance of the local innovation system demands attention in order to stimulate local knowledge development and exchange. What is particularly lacking missing are research incentives and capacity development of non-firm actors.

Literature

Acs, Z. J., and L.A. Plummer. 2005. Penetrating the ``knowledge filter'' in regional economies. *The Annals of Regional Science* 39 (3): 439-56.

Altenburg, T. 2008. Breakthrough china's and india's transition from production to innovation. *World Development* 36 (2): 325.

Asheim, B. T., O.Ejermo, and A. Rickne. 2009. When is regional "Beautiful"? implications for knowledge flows, entrepreneurship and innovation. *Industry & Innovation* 16 (1): 1-9.

Asheim, BT, R. Boschma, P. Cooke, 2011. Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases. *Regional Studies* 45 (7): 893-904.

Bennett, R. J. 1990. Decentralization, local government, and markets: Is there a post-welfare agenda in planned and market economies?1. *Policy Studies Journal* 18 (3): 683-701.

Bickford-Smith,V. 2008. Urban history in the new south africa: Continuity and innovation since the end of apartheid. *Urban History* 35 (2) (-08-01): 288-315.

Boschma 2005. Proximity and innovation: a critical assessment. *Regional Studies*, **39**, pp. 61-74.

Brata,A.. 2011. *Social networks and innovation (handicraft industry in bantul, yogyakarta).* Munich: MPRA, 28032.

Brata,A.. 2009. *Innovation and social capital in the small-medium entreprises: A case of bamboo handicraft in indonesia.* Munich: MPRA, 15696.

Carlsson, Bo, Z. J. Acs, D. B. Audretsch, P. Braunerhjelm,. 2009. Knowledge creation, entrepreneurship, and economic growth: A historical review. *Industrial and Corporate Change*.

Chaminade, C., and J. Vang. 2008. Globalisation of knowledge production and regional innovation policy: Supporting specialized hubs in the bangalore software industry.

Chen, J., Y. Chen, and W. Vanhaverbeke. 2011. The influence of scope, depth, and orientation of external technology sources on the innovative performance of chinese firms. *Technovation* 31, (8), 10.1016/j.technovation.2011.03.002.

Cohen, W. M., and D. A. Levinthal. 1990. Absorptive capacity: A new perspective on learning and inno. *Administrative Science Quarterly* 35 (1): 128.

Cooke, P. 2001. Regional innovation systems, clusters, and the knowledge economy. *Industrial and Corporate Change* 10 (4) (-12-01): 945-74.

Cooke, P. 2005. Regionally asymmetric knowledge capabilities and open innovation. *Research Policy* 34 (8) (-10-01): 1128-49.

Cooke P. 2012.

Criscuolo, P, and R. Narula. 2008. A novel approach to national technological accumulation and absorptive capacity: Aggregating cohen and levinthal. *The European Journal of Development Research* 20 (1): 56.

Dosi, G., F. Malerba, G. B. Ramello, and F. Silva. 2006. Information, appropriability, and the generation of innovative knowledge four decades after arrow and nelson: An introduction. *Industrial and Corporate Change* 15 (6): 891-901.

Dosi, G., and D.J. Teece. 2005. *Understanding industrial and corporate change: Edited by giovanni dosi, david J. teece, and josef chytry*. Oxford [etc.]: Oxford University Press.

Dutrénit,G. 2007. The transition from building-up innovative technological capabilities to leadership by latecomer firms. *Asian Journal of Technology Innovation* 15 (2): 125-49.

Dutrénit,G. 2004. Building technological capabilities in latecomer firms: A review essay. *Science, Technology & Society* 9 (2): 209-41.

Dijk, M.. van 2006. Industrial policy and technology diffusion: Evidence from paper making machinery in Indonesia. *World Development* 34 (12) (-01-01): 2137-52.

Edquist, C. 2001. *The systems of innovation approach and innovation policy: An account of the state of the art.* Aalborg: DRUID conference, .

Erikson, T. 2002. Entrepreneurial capital: The emerging Venture's most important asset and competitive advantage. *Journal of Business Venturing* 17 : 275-90.

Ernst, D. 2002. Global production networks and the changing geography of innovation systems. implications for developing countries. *Economics of Innovation and New Technology* 11 (6): 497-523.

EU 2008. *Science, technology and innovation in Europe.* European Commission: Luxembourg.

Fagerberg J., M. Fosaas and K. Sapprasert 2012. Innovation: Exploring the knowledge base. *Research Policy 41: 1132-1153.*

Febrina, A.S., 2009. Nurturing our creative streak. *Jakarta Post*.

Flatten, T., A. Engelen, S. Zahra, and M. Brettel. 2011. A measure of absorptive capacity: Scale development and validation. *European Planning Studies*(2): 98-112.

Florida, R.. 2005. The world is spiky. *The Atlantic Monthly (1993)* 296 (3) (-10-01): 48.

Fu, X., C. Pietrobelli, and L. Soete. 2011. The role of foreign technology and indigenous innovation in the emerging economies: Technological change and catching-up. *World Development* 39, (7), 10.1016/j.worlddev.2010.05.009.

Gaul 201. *Impact of ICT on improving SME performance in an urban kampong. Case study of kampung cyber RT36, Petahan, Yogyakarta.* HIS Erasmus University Rotterdam: Rotterdam.

Gereffi, G. 1999. International trade and industrial upgrading in the apparel commodity chain. *Journal of International Economics* 48 (1) (-06-01): 37-70.

Gereffi, G. 2005. The governance of global value chains. *Review of International Political Economy : RIPE* 12 (1) (-02-01): 78-104.

Gertler, MS, DA Wolfe, and D. Garkut. 2000. No place like home? the embeddedness of innovation in a regional economy. *Review of International Political Economy* 7 (4): 688-718.

Goel, V, 2004. *Innovation systems: World bank support of science and technology development*. Vol. no. 32. Washington, D.C: The World Bank.
Greeenhuizen, M. and N. Indarti 2005. *Knowledge and innovation in Indonesia. Artisan Furniture Industry.*
Humphrey, J., and H. Schmitz. 2002. How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies* 36 (9): 1017-27.
IKEA 2008. *Duurzaamheidsverslag 2008.* www.IKEA.com
IKEA 2010. *Sustainability report 2011.* www.IKEA.com
Indarti, N. 2010. The effect of knowledge stickiness and interaction on absorptive capacity: Evidence from furniture and software- small- and medium-sized enterprises in indonesia.University Library Groningen.
Ismalina, P. 2011. An integrated analysis of socioeconomic structures and actors in indonesian industrial clusters: Poppy Ismalina.University Library Groningen.
Ivarsson, I., and C. G. Alvstam. 2010. Upgrading in global value chains: A case of technology learning among IKEA-suppliers in china and south-east asia. *Journal of Economic Geography Advance Access*, joeg.oxfordjournals.org.
Jakarta Post. 2010. Government attempts to boost creative industry. *Jakarta Post*2010.
Jakarta Post. 2010. Government promises strong support for creative industries. *Jakarta Post*2010.
Jensen, M., B. Johnson, E. Lorenz, and B. E. Lundvall. 2007. Forms of knowledge and modes of innovation. *Research Policy* 36 (5): 680.
Kaplinsky, R. 2000. Globalisation and unequalisation: What can be learned from value chain analysis? *The Journal of Development Studies* 37 (2) (-12-01): 117-46.
Kaplinsky, R, and M. Morris. 2000. A handbook on value chain research.
Kaufmann, A, and F. Tödtling. 2001. Science–industry interaction in the process of innovation: The importance of boundary-crossing between systems. *Research Policy* 30 (5): 791-804.
Kojima C, "Batik Industrial Value Chain and Global Promotion of Yogyakarta Province: Constraints and Opportunities" (Student working group, 2010).
Lall S. 2001. *Competitivenss, technology and skills.* Northampton: Edward Elgar.
LallS.. 2003. Foreign direct investment. technology development and competitiveness: Issue and evidence. In *Competiotivenmess, FDI and technological activity in east asia.*, ed. S. Urata Lall S., 1. Cheltenham: Edward Elgar.
Lall, S. and R. Narula. 2006. Foreign direct investment and its role in economic development: Do we need a new agenda? In *Understanding FDI-assisted economic development.*, eds. R. Narula, S. Lall, 1-18. London: Routledge.
Lewitschnik, L. 2012. Happy Valley Yogyakarta. *Monocle June 2012, issue 54: 123-128.*
Lorentzen, J. 2009. Learning and innovation: What's different in the (sub)tropics and how do we explain it? A review essay. *Science, Technology & Society (New Delhi, India)* 14 (1): 177-205.
Lundvall, B. 2007. National innovation Systems—Analytical concept and development tool. *Industry & Innovation* 14 (1): 95-119.
Lundvall, B, B. Johnson, E.Andersen, and B. Dalum. 2002. National systems of production, innovation and competence building. *Research Policy* 31 (2): 213-31.
MacPherson, A. and R. Holt 2007. Knowledge, learning and small firm growth: A systematic review of the evidence. *Research Policy,* **36**(2), pp. 172-192.
Malerba, F. F. 2011. Learning and catching up in different sectoral systems: Evidence from six industries. *Industrial and Corporate Change* 20 (6) (-12): 1645-75.
Marins, L.. 2008. *The challenge of measuring innovation in emerging economies' firms: A proposal of a new set of indicators on innovation.* Maastricht: United Nations University - Maastricht Economic and social Research and training centre on Innovation and Technology, 2008-044.
Maskell, P., H. Bathelt, and A. Malmberg. 2006. Building global knowledge pipelines: The role of temporary clusters. *European Planning Studies* 14 (8): 997-1013.
Morrisson A.A., 2008. Global Value Chains and Technological Capabilities: A Framework to Study Learning and Innovation in Developing Countries. *Oxford development studies,* **36**(1), pp. 39-58.
Nelson, R. R. 2002. Technology, institutions, and innovation systems. *Research Policy* 31 (2): 265.
Nelson, R.R. 1994. The co-evolution of technology, industrial structure, and supporting institutions. *Industrial and Corporate Change* 3 (1): 47-63.
OECD 2005. *OSLO manual, Guidelines for collecting and interpreting innovation data*. Paris: OECD publications.
OECD 2006. *Comnmunity Innovation Statistics. From today's community innovation surveys to better surveys tomorrow.*
OECD, 2010. *SMEs, entrepreneurship and innovation.* OECD publishing: Paris.
Okamoto, Y, and S. Fredrik. 2003. Technology development in indonesia. In *Competitivenmess, FDI and technological activity in east asia.*, ed. Shujiro Urata Lall Sanjaya, 1. Cheltenham: Edward Elgar.
PEMBA 2003. *Outline business plan for Yogyakarta* (unpublished).
Pitelis, C., and D.J Teece. 2009. The (new) nature and essence of the firm. *European Management Review* 6 (1): 5.
Porter, M. E. 1990. The competitive advantage of nations. *Harvard Business Review* 68 (2): 73.
Rafiqui, P. S. 2009. Evolving economic landscapes: Why new institutional economics matters for economic geography. *Journal of Economic Geography* 9 (3): 329.
Shima, K., Onishi, and Leksono. 2006. Challenges and scopes toward the decentralized regional development framework in southeast asian countries: Several lessons from Yogyakarta special province, Indonesia.
Simatupang, T. 2010, "Creative Industry Mapping Projects in Indonesia: Experiences and Lessons Learned. Presentation for a Seminar in Ho Chi Min." Bandung Institute of Technology, Bandung, 2010.

Sternberg, R., and C. Muller. 2005. Entrepreneurship in regional innovation systems: A case study of the biotechnology industry in Shanhai. Copenhagen.
Suharmoko, A. 2008. Giovernment plans blue print for creative industry. *Jakarta Post*.
Suyanto, and R. A. Salim. 2010. Sources of productivity gains from fdi in indonesia: Is it efficiency improvement or technological progress? *The Developing Economies* 48 (4): 450-72.
Tambunan, T. "The Impact of the 2008-2009 Global Economic Crisis on a Developing Countrry's Economy: Studies from Indonesia" (Unpublished paper, No date).
Tambunan, T. 2006. *Development of small- and medium-scale industry clusters in indonesia.* Indonesia: www.kadin-indonesia.or.id, .
Tambunan, T. "Entrepreneurship Development in Indonesia" (Paper, www.kadin-indonesia.or.id, 2006).
Tambunan, T. 2006. *The role of government in supporting transfer of technology to and technology diffusion among indonesian nOn-farm small and medium enterprises. review of empirical studies and case study of tegal.* Jakarta: Center for Industry and SME studies, Faculty of Economics, University of Trisakti, 4.
Tambunan, T. 2006. *Transfer of technology to and technology diffusion among non-farm small and medium enterprises in indonesia.* Jakarta: Center for Industry and SME Studies, faculty of Economics, University of Trisakti, 3.
Tambunan, T. 2005. Promoting small and medium entreprises with a clustering approach: A policy experience from indonesia. *Journal of Small Busines Management* 43 (2): 138-54.
Tambunan, T, and H. Supratikno. 2004. The development of small and medium enterprises clusters in indonesia. *Gadja Mada International Journal of Business* 6 (1): 29-44.
T. A. Taufik, "Indonesia's Subnational Innovation System Policy and Programmes" (Workshop paper, Indonesia, 2007).
Teece, D. J. 2007. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal* 28 (13): 1319-50.
UNCTAD. 2010. *Creative economy report 2010*. Geneva: UNCTAF.
UNCTAD. 2008. *Creative economy report 2008*. Geneva: UNCTAF.
UNIDO 1998. Cluster diagnosis and action plan. Yogyakarta area. Leather goods cluster. UNIDO.
USAID 2006. Global market assessment for handicrafts, Washington: USAID.
Wengel, J. ter, and E. Rodiquez. 2006. SME export performance in indonesia after the crisis. *Small Business Economics* 26 : 25-37.
Wie, T.K.. 2006. *Technology and indonesia's industrial competitiveness.* Tokyo: ADB Institute, 72.
Winden, W. van, L. van den Berg, Luis Caralho, and Erwin van Tuijl. 2011. *Manufacturing in the new urban economy*. London: Routledge.
World Bank, and IFC. 2012. *Doing business subnational. doing business in indonesia.* Washington: International bank for Reconstruction and Development/ The World Bank.
Yin, R.K.. 2009. *Case study research: Design and methods*. Vol. 5. Los Angeles, CA [etc.]: Sage.
Zahra, S. A., and G. George. 2002. Absorptive capacity: A review, reconceptualization, and extension. *The Academy of Management Review* 27 (2): 185-203.

Annex 1: Description of firms respondents with structured interviews

	Name firm	Main actity	# staff	# staff subcontractors	Total staff	Turn over (US$)	Price segment	Product group
LSE	Bur silver	Exporter	400	600	1000	1.5 mln	High	silver, wood
	Out of Asia	Exporter	208	2000	2208	3 mln	Medium	all
	Lunar	Exporter	125	500	625	1.0 mln	High	wood, bags
	HS silver	Exporter	140	140	280	2.5 mln	Medium	silver
	Estetika	Exporter	50	1000	1050	3 mln	High	all
	Tashinda	Exporter	50	1.000	1050	1 mln	Medium	all
	Timboel	Exporter	60	750	810	1.7 mln	High	pottery
MSE's	Palem craft	Exporter	33			136.955	Medium	all
	Tropical	Exporter	70	50	120	800,000	Medium	ceramics
	Dekor	Exporter	65	300	365	200.000	Medium	Bamboo
	Siji	Exporter	25	100	125	480.000	Top	bathrooms
	Harpa green	Exporter		125		263.375	Medium	paper/ all
	Grandasi	Exporter	41	180	221	52.675	High	pottery
	Narti silver	Exporter	39	300	339	421.400	Medium	silver
	Salim silver	Exporter	45	0	45	105.350	High	silver
	KWAS	Exporter	79		79		High	wood
	AS Java	Exporter	12	40	52	63.210	High	Leather
SSE	Aru	Subcon	15	10	25		Medium	pottery
	Siyifa	Subcon	19	40	59		Medium	paperware
	Niyat	Subcon	11	10	21	7.375	Medium	pottery
	Doni silver	Subcon	5	5	10	15.170	High	silver
	Tumijo	Subcon	1	10	11	8.428	Medium	silver
	Teguh	Subcon	4	0	4	5.268	Medium	pottery
	Sidik silver	Subcon	4	0	4		Medium	silver
	Budi silver	Subcon	1	0	1		High	silver

LSE= more than 100 employees
MSE= 10-99 employees
SSE = 1-9 employees
Turnover = average past 5 years
Price segment product ranges from low, medium, high to top end
Number of employees = average last 5 years
Source: data collection

Annex 2: List of respondents of the qualitative study

Director, Dekor Asia, Yogyakarta

Director, HS Silver

Marketing Manager, Out of Asia

Head of Bureau, Bureau of Business and Technology, Basunan market, Bantul, Yogyakarta

Lecturer, ISI (university of arts), Yogyakarta

Ahmad, Director, Siji, Yogyakarta

Ahmed Assegaf, Director, Tropical Handicrafts, Yogyakarta

Aloysius Brata, researcher. Vrije Universiteit Amsterdam

Bambang Ideto, Head jewelry lab, Center for Handicraft and Batik, Ministry of Industry, Yogyakarta

Bram Satya Bramantya, designer and previous general manager, Lunar, Yogyakarta

Budi Virgono, Director and Designer, Amani Green, Yogyakarta/ active member Asmindo

Budi, silver artisan, Katogede, Yogyakarta

Deddy Effendy, Director Palem Craft; deputy director of Asmindo

Devita Febriani, Credit Officer, Bank BPD DIY, Begusan office, Yogyakarta

Edy Suryanto, Research and Development Manager, Out of Asia

Endro Wardoyo, Director, Gradasi, Yogyakarta

Fani Rintamaya, Credit Officer, Bank BPD DIY, Begusan office, Yogyakarta

Hartono, Syifa Handicraft, Bantul, Yogyakarta

Iskandar, marketing manager, HS Silver

Johny Sahlan, Director, CV Tashinda Putraprima, Yogyakarta

Joko Prihantoko, head subdivision of training of production techniques, Department of Trade and Industry, Yogyakarta City Council

Ma'sum, Director and operation manager, Estetika, Yogyakarta

Mark Kwami, Director MKwami Design Services, consultant of CBI

Nurhadi, production manager, Harpa Green, Yogyakarta

Nurul Indarti, Deputy Director Academics and Research, faculty of Economics and Business, University of Gadja Mada

Pandit Pintoro, Director, Narti's Silver, Yogyakarta

Poniyat, Director, Niyat Ceramic, Kasonan, Yogyakarta

Poppy Ismalina, Director, Faculty of Economics and Business, University of Gadja Mada

Priyo Salim, Director, Salim Silver, Yogyakarta

Robertus Agung Prasentya, Director. KWAS, Yogyakarta

Sally Sagita, Director, Burubudur Silver, Author book on Indonesian filigree, Yogyakarta

Sidik Suriyando, silver artisan, Katogede, Yogyakarta

Somo, Director, Aru Ceramics, Kasonan, Yogyakarta

Suharyanto, Head Technologfy and Incubation Department, Center for Handicraft and Batik, Ministry of Industry

Sumawan, Director, Doni Silver, Yogyakarta

Teguh, Director, Teguh Karya Ceramics, Kasonan, Yogyakarta

Thomas, Head Marketing, Tropical Handicrafts, Yogyakarta

Timboel, Director Timboel Ceramics, Kasonan, Yogyakarta

Tosan Tri Putro, lecturer, product design department, faculty of architecture and design, Duta Wacana Christian University, Yogyakarta

Triningsi, wife and business partner, Doni Silver, Yogyakarta

Tumijo, silver artisan, Katogede, Yogyakarta

Umer Setiadji, Marketing Department, Center for Handicraft and Batik, Ministry of Industry, Yogyakarta

Wawan Harmawan, Director Harpa Green, secretariat of Asmindo

Yuli Sugianto, Chairperson Yogyakarta, Asmindo (Indonesia Furniture and handicraft association)

Yunastuti Daud, Permanent Committee for International Affairs, Chamber of Commerce and Industry, Yogyakarta

Annex 3. Statistical data

Table 1: association of acquisition indicators (V-Cramer/significance)

	Travel	Language	Access to knowledge	Observe
Travel	X	.739 / ,.000	.006/.952	.470/000
Language	.739/.000	X	.069/.493	.348/.003
Access to knowledge	.006	.069	X	.417/.004
Observe	.470/.000 (negative)	.348/.003 (negative)	.417/.004	X

Table 2: absorptive capacity and role in value chain

	Role in value chain		
	Exporter	Subcontractor	Combination
	Mean	Mean	Mean
Acquire (scale 0-2)	$2,0_a$	$,5_b$	$1,4_c$
Assimilate (scale 0-5)	$4,2_a$	$2,1_b$	$3,2_a$
Potential (scale 0-5)	$3,6_a$	$1,4_b$	$2,7_a$
Transform (scale 0-3)	$2,2_a$	$2,5_a$	$2,4_a$
Exploit (scale 0-1)	$0,5_a$	$,1_b$	$,0_b$
Absorptive capacity	$3,4_a$	$1,0_b$	$1,7_b$

Note: Values in the same row and subtable not sharing the same subscript are significantly different at p< ,05 in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.[1]

1. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

Table 3: regression of assimilation indicators with innovation

Indicator	**Beta/ significance**
Constant	2.763/.000
Department (dummy)	.385/,003
Capacity of designer	.554/.024
Staff training	.497/.048
Capacity of staff	-.306/.086
Capacity of management	.000/.999
Discuss innovation with staff (dummy)	.035/.862

ANOVA test significance of .000

Table 4: association of assimilation indicators (V-Cramer/ significance)

	Train staff	Having departments	Discuss innovations with staff	Constraint: capacity design	Constraint: capacity managers	Constraint: capacity staff
Train staff	X	.631/.000	.335/.004	.215/.035	.044/.663	.191/.059
Dep'ts	631/.000	X	.412/.002			
Discuss	.335/.004	.412/.002	X			
Constraint: designers	.214/.034	.160/.291	.74/.760	X	.012/.906	.042/.673
Constraint: mgrs	.044/.663	.248/.051	.234/.065	.012/.906	X	.110/.271
Constraint: staff	.191/.59	.149/.340	.137/.393	.042/.673	.011/.271	X

Table 5: association of transformation indicators (V-Cramer/ significance)

	Innovation ivestments*	Money borrowed*	Business Plan available*	Constraint: subcontractor capacity	Constrain: capacity staff	Constraint: access to finance
Invest	X	.353/.000	.408/.000	.131/.426	.120/,488	.124/ .466
Borrow	.5/.000	X	.629/.000	.269/.028	.140/.379	.215/.101
Business plan	.577/.000	.629/.000	x	.304/.026	.220/.183	.101/.795
Constraint: subcons	.131/.426	.269/.028	.304/.026	x	.203/.042	.207/.038
Constrain: capacity staff	.120/.488	.140/.375	.220/.183	.203/.042	X	.037/.714
Constrain: access to finance	.124/.466	.215/.101	.101/.795	.207/.038	.037/.714	x

*Investment, borrowing and business plan significantly associate with each other and were computed into a new variable. The three constraints do not associate significantly with most others.

Table 6: correlation coefficients for local innovation system (Pearsons)

	Chamber of Commerce	Business Association	Cluster Assoc.	Govern-ment	Universities	Finance Instit.	Exporters	Local firms
Chamber of Commerce	1	,684**	,460**	,529**	,319**	,267**	-,075	,158
Business Association	,684**	1	,441**	,605**	,272**	,326**	-,113	,205*
Cluster Association	,460**	,441**	1	,519**	,301**	,298**	-,019	,199
Government	,529**	,605**	,519**	1	,351**	**,308****	-,080	,219*
Universities	,319**	,272**	,301**	,351**	1	,279**	-,043	,141
Finance Institutes	,267**	,326**	,298**	,308**	,279**	1	,166	,025
Local exporters	-,075	-,113	-,019	-,080	-,043	,166	1	,147
Local firms	,158	,205*	,199	,219*	,141	,025	,147	1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).