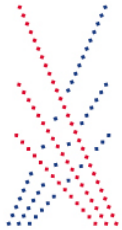

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Unpacking SME Owners' Practice of Collaboration in Local Supply Chains in India

This paper analyses local collaboration initiative' motives of SMEs within their supply chains and business networks for products and services development. Based on a mixed method approach, which includes qualitative interviews and a survey of 175 SME owners and executive management, this study characterises practice of India-based inter-firm networks. The survey dataset allows for an empirical analysis of the various collaboration initiatives that are typically pursued by India-based SMEs in manufacturing and engineering-related sectors. Although previous research has studied individual categories of SME collaboration, there is yet little quantitative insight into the patterns of SME collaboration in South Asia. We find that India-based SMEs engage in horizontal collaboration and for doing so, may draw upon extended business family, informal business practices and friend networks. Our paper informs future studies of informal ties, which are at the interface with formal supply chains. The findings systematise the manifold collaboration opportunities and hence provide a set of collaboration ideas for any new or inexperienced SME owner in South Asian context.

Keywords: India, SME, Collaboration practice

1 Introduction

This paper contributes to the field of collaboration strategy as a set of practices and observed activity (Whittington, 2017); it does address themes of SMEs' cooperation along a supply chain (Barratt, 2004; Formentini & Romano, 2016; Liao et. al., 2017; Ramanathan & Gunasekaran, 2014; Skjoett-Larsen et al., 2003), especially looking at their inter-firm relationship (Banchuen et al., 2017; Hossain & Kauranen, 2016; Petrick et al., 2016) rather than multinational firms' multilateral strategic alliances (Athreye, 2013; Larimo et al., 2015; Prashantham, 2015; Todeva & Knoke, 2005). Given that motives and forms of cooperation can be manifold (Shenkar & Reuer, 2006), this paper advocates a full review of SMEs' practice rather than pre-assuming particular motives of collaboration in the Indian context. SMEs in India are concerned about tight competitiveness in times of global trade and industrial development across South Asia (Thakkar et al., 2009a; Singh et al., 2008, 2010).

Few comparative, large-scale papers have been published on SME-specific collaboration issues (Bellmunt & Torres, 2013; Mitja et al., 2006; Quayle, 2003; Singh et al., 2008; Towers & Burnes, 2008; Vaaland & Heide, 2007;). This is despite SMEs differing from large corporations inter alia in terms of their innovation abilities, structure and planning horizon (Archer et al., 2008; Arend & Wisner, 2005; Bhagwat & Sharma, 2006; Huin et al., 2002; Kumar et al., 2015). Furthermore, for a better understanding of SME collaboration patterns, cross-industry research is required (Camison & Lopez, 2010; Cao & Zhang, 2011, 2013; Cheng et al., 2014; Prajogo & Olhager, 2012). The authors find a research gap regarding Indian SMEs' collaboration practice to which the paper contributes.

Researchers have depicted vertical supply chain issues of SMEs rather than practices of horizontal collaboration, for example supply chain management practice (Sahay & Mohan, 2003); trust in suppliers (Krishnan et al., 2006); supply chain strategy and collaboration (Barratt, 2004; Singh et al., 2008, 2010); and performance measurement and success factors (Kumar et al., 2015; Thakkar et al., 2009b).

The structure of the paper is as follows. Section two collates the published work on SME collaboration. The methodology is covered in section three, whereas the findings are discussed in section four. Thereafter, section five discusses the collaboration structure identified in the Indian context. Finally, section six concludes the paper.

2 SME collaboration literature

Studies of SME internationalisation include how SMEs establish partnerships and operations in the host market. However, few studies have yet been conducted with larger quantitative data sets, including SMEs from Australia, Brazil, China, Denmark, Finland, Italy, Sweden and Turkey (Besser & Milier, 2010; Cerrato et al., 2016; Fulop, 2000; Gao et al., 2016; Özcan, 1995;

Sandberg, 2013, 2014; Torkkeli, 2014; Torkkeli et al., 2016; Ulrich et al., 2014). International expansion is also a collaboration motive of Indian and Asian SMEs (Antoldi et al., 2011; Elango & Pattnaik, 2007).

For instance, Schweizer (2013) conceptualises a process whereby SMEs can overcome the 'liability of outsidership' after entering foreign markets. Small firms are often outsiders in terms of network ties abroad, access to international value chains and foreign market-specific or consumer-specific knowledge (Lindstrand et al., 2012; Measson et al., 2015; Schweizer, 2013). SMEs may lower the costs of the internationalisation process if they establish inter-firm relations and use foreign-market, gatekeeping or trade specialist firms (Gao et al., 2016).

The need for integration into global, multinational firms led value chains to engage in vertical collaboration. Such integration particularly refers to exporting and technology SMEs, for instance in the software industry (Chaminade & Vang, 2008; Etemad et al., 2001; Upadhya, 2004). Vertical collaboration, especially with customers and suppliers, increases innovation performance (Zeng et al., 2010; also see Kühne et al., 2014; for India see Wiengarten & Longoni, 2015). Collaboration mitigates supply and demand risks (Chen et al., 2013) and, in marketing and purchasing, partnership generates value in the supply chain. The retail network itself can become the locus of innovation (see Tambo, 2014; Wagner & Eggert, 2016).

SMEs collaborate with each other horizontally for R&D and innovation commercialisation purposes. Collaboration then facilitates risk sharing, financing larger innovation portfolios and a more radical approach to new product development (Lee et al., 2010; Qiao et al., 2014; Van De Vrande et al., 2009). Horizontal collaboration, in the family network context, also increases long-term venturing success (Eberhard & Craig, 2013). Customers may collaborate with each other on the joint purchasing of complex technology (Gobbi & Hsuan, 2015).

Cruijssen et al. (2007) and Leitner et al. (2011) find that horizontal collaboration in logistics increases productivity or efficiency and cuts costs. Capacity sharing is another motive for collaborating horizontally and in a long-term supply chain partnership (Moghaddam & Nof, 2014; Seok & Nof, 2014). These studies do not specifically focus on SMEs; however, horizontal and vertical inter-SME collaboration increases the absorptive knowledge capacity (Lee, 2007; Leiponen & Byma, 2009). Supply chain collaboration increases sales and consequently firm performance (Cao & Zhang, 2011).

Only a few studies address India-based SMEs' collaboration specifically (e.g., Krishnaswamy et al., 2014; Sikka, 1999) and Indian SMEs in the context of specific industries, such as the automotive and chemical industry sectors (Jayaram et al., 2014; Kumar & Subrahmanya, 2010; Majumdar, 2010). While some articles address the inter-firm structures of Indian SMEs (Ghani et al., 2014; Tomlinson & Fai, 2013), the practices and patterns of collaboration remain under-researched using quantitative methods. The forms of 'collaboration' vary among the previously cited studies, thus indicating the lack of a coherent body of knowledge.

3 Methodology

Survey

The paper applies the survey method (Flynn et al., 1990; Forza, 2002) to collect data on collaboration practice in Indian SMEs. The survey items were pre-tested with a qualitative pilot study, including interviews with 8 faculty members (bespoke experts in SME Studies or Operations Management), 5 PhD students and 10 SME owners. The questionnaire items were tested for reliability, achieving an acceptable level (Cronbach's alpha≥0.6). The respondent statements quoted in this paper are extracted from the company owner interviews. SMEs are defined in accordance with the Reserve Bank of India: companies with investment in plant and machinery of ≤INR 10 crore (equal to about £1 million). The questionnaire asked the respondents to characterise the products offered, which enabled the SMEs to be assigned to industry sectors.

For the main survey, the authors identified 1,050 manufacturing SMEs from the Audyogik Kendra Vikas Nigam businesses database. The listing is representative of SMEs based across India. The authors approached all the senior managerial-level contacts, as they command detailed knowledge of their corporation's collaborative strategy and organisational structure.

The questionnaire pack was sent to nearly 630 firms; 204 respondents completed the questionnaire. Incomplete responses and those completed by lower-level hierarchy staff were removed (29 responses). In sum, the paper analyses a data set of 175 responses (27.8% response rate). Figure 1 provides a breakdown of the respondents' hierarchy ranks.

--- Figure 1 about here ---

Variables and data sampling

The collected data cover a variety of manufacturing SMEs and all levels of R&D intensity in India. The industries in the sample span from high to low technology to control for the argument that certain forms of collaboration would be favourable to a specific industry's R&D intensity level (see the industry breakdown in Table 1).

--- Table 1 about here ---

Joint ventures aim to pursue the common interests of two partners in an equal relationship (Bengtsson & Kock, 2000). According to the Western literature, joint ventures are formed to pursue common, long-term, strategic interests. In our survey the item 'joint venture' is a proxy for SMEs with a joint corporate strategy. The item 'collaborative planning, forecasting and

replenishment' (CPFR) covers the strategic aspects of collaboration with suppliers or customers (Cassivi, 2006).

With increasingly shortened product lifespans and an accelerated pace of innovation, companies engage in co-development for R&D and knowledge generation. Co-development allows a partner to tap into new sources of innovation and to absorb external know-how and ideas (Chesbrough et al., 2006; Lau et al., 2007). This paper furthermore applies the term 'co-design', in which design refers not to the technology or basic R&D but to the features, form and aesthetics of the product artefact or the service blueprint (Wang et al., 2009; Zhang et al., 2009).

Collaborations in operations and supply chains provide efficiency gains from joint manufacturing and experience exchange, joint purchasing or collaboration in logistics provision (Cruijssen et al., 2007; Gobbi & Hsuan, 2015; Moghaddam & Nof, 2014; Seok & Nof, 2014).

Joint problem solving refers to the partners possessing joint decision-making capability. In partnerships firms are better able to face complex or risky decision making (Hirokawa et al., 1996; Klein et al., 2001). Sharing resources can involve IT, back-office functions or industry standardisation and aims to increase efficiency, ensure full capacity usage and cut costs (Cassivi, 2006; Maglaras & Zeevi, 2003; Seok & Nof, 2014).

Table 2 lists the specific collaboration motives queried in the survey. The survey items for collaboration initiatives were developed from the pilot study and the literature review.

--- Table 2 about here ---

Moderating variables

The respondents were asked to confirm the use of formal collaboration. Of the Indian SMEs, 65% collaborate with external partners whereas 35% do not. A formal partnership is a long-term business collaboration that the partners explicitly discussed a priori regarding its general terms and conditions. In the Indian context, that does not imply a legal contract, it does not usually a priori specify the terms of operations and it does not require liabilities to be specified in the case of failure. However, it is built on soft liabilities, such as trust and social and family commitments. The authors' analysis clusters the companies according to their industry sector's R&D intensity. This is a well-accepted proxy variable of innovativeness. Our analysis excludes 16 firms from the data that are not classified as HT versus LT (again see Table 1). Out of the remaining 159 respondents, 113 have or have had some kind of formal collaboration.

Literature suggests that ownership structure, firm size, firm age and supply chain settings affect the choice of inter-firm collaboration (e.g., Hagedoorn, 2002; Holweg et al., 2005; Manolova et al., 2010), so that rigour review of collaboration practice needs to account for those variables.

The variable 'form of collaboration' (vertical, horizontal) correlates significantly with three other variables: type of ownership (local, foreign, local–foreign; chi-square value χ^2=10.96, p=0.005); network structure (SMR, SMDR, SMWR, SMWDR; χ^2=13.16, p=0.024); and age of SME (new, young, mature; χ^2=5.58, p=0.052).

The analysis of variance (ANOVA) and a post-hoc test explored the impact of the ownership type, supply chain structure and age of SMEs on vertical and horizontal collaborative initiatives. Based on this analysis, this study finds statistical differences at $p<0.05$ in the different collaborative initiatives for the groups of respondents. Eta-squared values were also used to determine the effect size of the results. The results indicate significant differences between the supply chain collaboration initiatives in terms of ownership and network structure. However, supply chain initiatives are not found to be statistically different in terms of SMEs' age.

4 Findings

Observed collaboration initiative motives

Collaborative work, such as joint problem solving, CPFR and aggregated purchasing, is frequently reported by the respondents; joint ventures, co-manufacturing, co-design and sharing resources are likewise common. Conversely, the respondents refer less often to co-logistics and co-development initiatives. Table 3 provides further details.

--- Table 3 about here ---

About 56% of the local SMEs and 90.0% of the local–foreign joint venture SMEs collaborate with other external organisations. A high degree of supply chain structure complexity (SMWDR) may lead to a slightly lower frequency of collaboration, with 52% reporting collaboration for SMWDR compared with more than 70% for a medium-complex supply chain (SMDR and SWMR). Mature firms state that they collaborate more often than younger firms. Figure 2 displays the numbers for external collaboration.

--- Figure 2 about here ---

Type of ownership

Local SMEs focus more on horizontal than on vertical relationships for co-manufacturing, aggregated purchasing and shared resource initiatives. Foreign–local SMEs also focus more on horizontal relationships for most of the collaboration initiatives, except CPFR and joint problem solving. For the latter they prefer vertical network partners, that is, customers or suppliers. However, they apply vertical and horizontal collaboration equally for co-development, co-design

and co-logistics initiatives. Table 4 depicts the descriptive results for the association of 'type of ownership' and 'forms of collaboration' (chi-square value=10.96, p=0.005). Similarly, foreign SMEs focus more on vertical collaboration for their co-design, joint problem solving and resource sharing.

The results suggest that foreign SMEs are not likely to collaborate vertically but prefer horizontal collaboration. Table 4 again highlights how foreign firms almost disregard all the identified collaboration initiatives. The estimates of collaboration initiatives for local firms' vertical collaboration are mostly below 30%. Conversely, a number of horizontal collaboration initiatives score highly. Both local and local–foreign firms engage vertically with their supply chain on CPFR. Shared resource initiatives with horizontal partners are preferred by local as well as local–foreign SMEs.

--- Table 4 about here ---

Firm age

On the basis of SMEs' age, this study's results show that 59.0% of 'new' SMEs (established within the last 5 years), 55.6% of 'young' SMEs (established for 5–10 years) and 69.0% of 'mature' SMEs (established for more than 10 years) collaborate with other external organisations. The test does not, however, confirm the association between the age of SMEs and the forms of collaboration (chi-square value χ^2: 2.82, p=0.244). This contradicts the descriptive evidence previously found in Figure 2. Likewise, the 'age of SMEs' and 'forms of collaboration' are not associated at the 5% significance level, however they are at the 10% significance level (Table 5).

Surprisingly, the confidence interval scores for the different collaboration initiatives do not differ significantly for the age of the firm (Table 5). The pattern observed here indicates that firms' resource endowments and growth dynamics do not explain their choice of collaboration initiatives. There is a tendency to choose horizontal collaboration in India regardless of the firm age.

---Table 5 about here ---

The 'new' SMEs are more inclined to collaborate horizontally on joint ventures, co-development, co-design, aggregated purchasing or shared resources. At the same time, they are more inclined to engage in vertical collaboration for co-logistics, CPFR and joint problem solving. This paper observes a similar pattern for 'young' and 'mature' SMEs. Additionally, they prefer horizontal collaboration for co-manufacturing as well as co-logistics. 'Young' SMEs prefer vertical relations for CPFR and vertical and horizontal collaboration equally for joint problem solving. One owner highlighted joint purchasing as good opportunity from which other inter-firm initiatives can follow:

> 'It's in our best interest to transfer best practice to partners, making their purchasing and procurement more effective and less costly. In return, we receive better prices from them [the suppliers]. This is a win-win deal for both of us. [….] The partners and us feel that the higher are the collaborative efforts, the better our procurement results become. We are planning to extend these collaboration relationships into other areas, such as joint design, joint manufacturing and possibly resource sharing. (Owner of a construction company, on aggregated purchasing).'

Our respondents highlight that efficiency particularly motivates collaboration in manufacturing and logistics. This explains why the confidence intervals' CI High is higher for more mature firms than for younger firms. One may argue that economies of scale and efficiency gains pay off the larger the scale of operations. A manufacturer states:

> 'This sharing of both manufacturing and logistics facilities has resulted in lower inventory stock levels. It reduces the costs of production and transportation; increases the ability to produce more output; and increases the speed of supplying products to new markets [….] This collaborative working in manufacturing and logistics has benefited us and our partners and will further save a significant amount of investment in new machinery, plants and vehicles used in transportation (Owner of a small steel manufacturing plant, on co-manufacturing and co-logistics initiatives).'

Network structure

There is a statistical association of 'form of collaboration' and 'network structure' (χ^2: 9.47, p=0.024). The authors map the supply chains and business relationships by categorising the partners into supplier (S), manufacturer (M), wholesaler (W), distributor (D) and retailer (R). Of the SMEs with S-M-R structures, 60.0% collaborate externally, while nearly 77.0% of those with S-M-D-R and S-M-W-R structures collaborate externally. However, only 51.0% of the SMEs with the more complex (S-M-W-D-R) structures were found to collaborate externally. A chi-square test was conducted on the association between 'forms of collaboration' and 'network structure' (χ^2: 13.16, p=0.004). The results are given in Table 6.

--- Table 6 about here ---

Supply chain complexity does not affect collaboration patterns, except for 'co-logistics' and 'joint problem-solving' initiatives. Co-logistics collaboration is more likely to be vertical for either the simplest or the most complex supply chains (S-M-R, S-M-W-D-R). Horizontal initiatives are more probable for moderately complex supply chains (S-M-W-R, S-M-D-R). 'Joint problem solving' in S-M-R supply chains is more likely to be vertical and in S-M-W-R supply chains is more likely to be horizontal. Regardless of the specific supply chain structure, CPFR as a motive is pursued in vertical partnerships. Other initiatives are carried out as horizontal partnerships (Table 6).

The respondents' statements provide an understanding of the emphasis on different kinds of horizontal collaboration:

> 'My collaborative partner and I shared similar levels of upbringing due to extended family. He is my cousin. This has provided us with a great opportunity to share things since our childhood. The [extended] family structure supported us, as collaborative partners, when sharing business information and joint resources. It has also helped for joint discussion of business problems, mutual support and building trust and confidence in making joint business. We can see the business needs of each other in the full picture. The strong relationship has developed our ability to gain competitiveness. Our collaboration has also increased the capacity to mitigate operational risks (Owner of a brick manufacturing company, engaged in co-manufacturing and co-logistic initiatives).'

Family serves as a network for business opportunities, mainly in an informal sense. Furthermore, off-business social places can offer formal business opportunities:

> 'Basically, I found my collaborative partner in a swimming pool. It was at a weekend, after having completed my first lane of swimming exercise. I suddenly saw a familiar face next to my lane. We went to the same school. That time we were good friends but somehow later on lost contact with each other. Over our discussions, we found we are working in similar businesses. So we decided to work together as collaborative partners. Ever since then, we learn from each other as we exchange and share our skills and competences. Being friends, we truly engage into the collaboration, more than with other companies: we actively exchange sensitive information and engage in joint decision making. The partnership means we are open and willing to take on board new ideas, improving business performance. We hold some business meetings in the pool where we initially met again, after we lost touch 20 years [respondent laughs] (Owner of a garment industry company, engaged in co-manufacturing and joint problem-solving initiatives).'

R&D intensity

The paper's data set contains 57.2% companies from high- and medium-high-technology sectors and 42.8% companies from low-technology and medium-low-technology sectors.

The clustered results reveal that high- and medium-high-technology firms in general tend to commit to more collaboration initiatives than low-technology and medium-low-technology firms. The opposite holds for vertical collaboration in the co-design of products or shared resources and horizontal collaboration in aggregated purchasing or co-logistics. Table 7 illustrates the pattern. The correlation of collaborative initiatives with variables other than R&D intensity does not appear to be statistically significant for the clustered data.

The respondents highlight that the search for new product development knowledge drives particularly co-design and co-development initiatives:

> 'At the end of the day, it is the knowledge we gained through jointly designing products and processes that makes these processes [co-design and co-development] a success. We then required less investment in our R&D activities over the past couple of years. Our costs and resources spent on development have decreased since we entered into the collaborations with our partners. [….] We increasingly rely on our partners' ability to create new products and services jointly with us (Chairman of a furniture company, engaged in co-development and co-design initiatives).'

Interestingly, several variables' CI High confidence intervals (horizontal initiatives) are higher for the HT/MHT segment than for the LT/MLT segment (again see Table 7). The data also demonstrate that the purposes of collaboration are more likely to be pursued in horizontal partnerships for HT/MHT firms and vertical partnerships for LT firms.

---Table 7 about here ---

5 Discussion

India-based SMEs acknowledge the importance of both horizontal and vertical inter-firm collaboration while tending to co-operate horizontally more than vertically. Furthermore, Indian SMEs' collaboration is based on extended family and friend networks. Informal ties facilitate easy business relations, allow for empathy and provide trustworthy business relationships:

> 'We [the collaborative partners] have grown up in the same residential area. So, our family members had various opportunities to meet at [extended] family and public social events. We went to the same school, then later on to the same university. This is why we had already shared a lot of common things before we entered into a collaborative business partnership. As we felt safe sharing our vehicles at university, why can't we now share our business resources? I think sharing is a great gift that we carry on from our common social and family structures. Such sharing [practice] means caring for each other and aligning our interests for joint success (Owner of a food processing company, engaged in co-logistics and resource-sharing initiatives).'

Another owner highlighted how collaboration opens up the entire company for the partner to participate:

> 'When you feel that you are part of the decision-making process of the partner firm, then collaboration is working. We invite our partners to our regular board meeting, and we encourage them to contribute and chat with us to reflect on our organisational issues. The joint problem solving has increased trust and enables us to resolve problems in better ways. […] We feel that we are all sitting in the same boat and share the goal of being able to work as a team (Owner of a chemical company).'

Entrepreneurs and SMEs in India are said to utilise their family network background for resourcing rather than relying on venture capital. This point aligns with the pilot study's findings.

> 'The most significant motivating trigger for entrepreneurship [in India] was found to be wide ranging across regions – from "family background" being the prime trigger in Ahmedabad and Kolkata to "market opportunity" serving as the most important motivator in Bangalore. Gujarat has been a traditional trading and business hub that may explain greater influence of family background as a prime trigger. In West Bengal, the seeds of entrepreneurship were sown by migrants belonging to traditional business communities from Rajasthan. […] Entrepreneurs from Hyderabad valued "independence" as a trigger more than other factors (National Knowledge Commission, 2008: 11f).'

The authors' findings also suggest that the elders in the family-based 'informal business network' function as a kind of councillor:

> 'We [the collaborative partners] get manifold business opportunities emerging over family dinners and other family gatherings. This is where we share and discuss our business strategies. The informal scene makes our relationship stronger and encourages our business. Likewise, our elders contribute to our strategy making when they share their personal and business experiences. They add valuable business practices instantly when we need that advice most (Owner of a furniture company, having a joint venture with his cousin's company).'

Family networks are a valuable resource for new entrepreneurs: '*Second generation entrepreneurs in the same business enjoy a much higher degree of family support (96%) than second generation entrepreneurs in a different business (88%) or first generation entrepreneurs (67%)*' (National Knowledge Commission, 2008: 23). Our interviewed owners similarly stressed the role of outside business acquired personal networks for nurturing own business later on:

> 'My collaborative partner and I shared similar levels of upbringing due to extended family. He is my cousin. This has provided us with a great opportunity to share things since our childhood. [...] We can see the business needs of each other in the full picture (Owner of a brick manufacturing company, engaged in co-manufacturing and co-logistic initiatives).'

> 'Basically, I found my collaborative partner in a swimming pool. It was at a weekend, after having completed my first lane of swimming exercise. I suddenly saw a familiar face next to my lane. We went to the same school. [...] Being friends, we truly engage into the collaboration, more than with other companies (Owner of a garment industry company, engaged in co-manufacturing and joint problem-solving initiatives).'

Likewise, the purpose of entrepreneurship in India is different from the US start-up image. For example, the Indian 'street entrepreneur' is not set up for expansive growth (Williams & Gurtoo, 2013). Correspondingly, there are few studies on informal entrepreneurs' business collaboration in Western countries (Quince, 2001; Williams, 2013). There might be a significant effect of informal, inter-organisational relationships on entrepreneurial success, regardless of the country context. It is unique to India, this study illustrates, that horizontal business networks dominate the collaboration practice; extended families, social bonds and joint biographies play a significant role.

The paper's results show that fewer young SMEs than mature SMEs collaborate. This contradicts new SMEs' resource scarcity. That is, '*SMEs [in India] face a number of problems – Absence of adequate and timely banking finance, limited capital and knowledge, non-availability of suitable technology, low production capacity, ineffective marketing strategy, identification of new markets, constraints on modernisation and expansions, non-availability of highly skilled labour at [an] affordable cost*' (Small and Medium Business Development Chamber of India). The pattern that we find concerning the age of firms is thus not intuitive. However, extended family networks may indeed fill this gap in the first few years of a newly established SME.

This study generated a unique data set for India-based SMEs. The authors suggest the need for new terminology in the Asian business collaboration context, that is, incorporating variables of society ties and family ties.

6 Conclusions

This is one of the first comprehensive survey studies of India-based SMEs' collaboration motives. The paper specifically investigates manufacturing firms registered or having a branch in India. The paper reveals a mix of motives and practices that SMEs apply simultaneously. We find that that India-based SMEs emphasise horizontal collaboration. Not firm size or firm capabilities of functional kind but the owners' social relations such as, family, friends, schooling and university, or sports clubs create preferred ad-hoc collaboration opportunities. Future studies may want to compare the structure of different countries' SME informal, supply chain-related business networks through the lenses of cross-country, cross-cultural and cross-industry segment data sets.

Joint ventures, joint problem solving, aggregated purchasing, co-manufacturing and shared resources are the most prominent horizontal collaborative initiatives in our sample. Firms equally choose co-development and co-design with horizontal and vertical partners. The case of India-based SMEs may be different from Western economies in the way that it lacks a clear pattern of high technology intensive versus low technology industry collaboration patterns.

Indian SME networks are strategic and informal at the same time, complemented by strong family and social structures. How this informal structure differs among industries and the physical kinds of meetings at which networks conduct their business could be topics for future papers.

The explorative character of our unique primary data set is promising, given that the data solely contain India-based SMEs. The sample however does not yet allow for cross-country comparison with other Asian countries. Moreover, the sample size of 175 SMEs might not be sufficient to reveal correlations among the variables.

The findings indicate promising avenues for future SME business network research. Family structure appears to be important for Indian SME practice. It should be studied in cross-country data sets to judge whether such findings can be generalised. The way in which gender may affect the motives, locations and practice of collaboration is also under-researched. For informal contacts, social norms might then be a moderating variable. Further, researchers have not yet systematically investigated whether SME business networks operate in industry-specific manners.

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8 Appendices: Figures and Tables

Tables

Table 1: Clustering of industries covered in our data set, by R&D intensity

Cluster	Industrial sector (R&D intensity)	N	in %
HT/MHT cluster (N: 91)	Electrical, electronics and computer parts/components (HT[a), b)])/(MHT[a)]).	18	10.3%
	Engineering – including automation, tools, machinery and auto components (industrial engineering, machinery and equipment: MHT[a), b)]).	25	14.3%
	Heavy industries – including cement, steel and mining (industrial engineering, machinery and equipment: MHT[a), b)]).	18	10.3%
	Pharmaceuticals (HT[a), b)]) and chemical material/products (MHT[a), b)]).	30	17.1%
LT/MLT cluster (N: 68)	Construction – including tiles, roofing and bricks (LT[a)]).	27	15.4%
	Food (LT[a), b)]), food processing (MLT[a)]) and beverages (LT[a), b)]).	13	7.4%
	Furniture (LT[b)]) – including wooden, steel and aluminium fabrication.	11	6.3%
	Paper products and printing/packaging (LT[b)]).	12	6.9%
	Plastic and rubber products (MLT[b)]).	5	2.9%
(Excluded)	*General – including medical equipment (HT[a), b)]), textiles (LT[b)]) and apparel.*	*15*	*8.6%*
	Others.	*1*	*0.6%*
Total		**175**	**100%**
Total included		**159**	**90.9%**

HT: high technology. MHT: medium-high technology. LT: low technology. MLT: medium-low technology.

[a)] European Commission (2013, section 1.2.2, R&D trends by world regions and sector groups).
[b)] OECD (2011).

The data collected cover manufacturing SMEs with investments in plant and machinery ≤INR 10 crore (equal to about £1 million). This is the Indian Government's and the Reserve Bank of India's definition of SMEs.

Table 2: Survey items for collaboration initiative motives

Motive	Description of why to collaborate with external partners	Cron-bach alpha
Joint venture[a)]	A collaborative structure that combines resources from more than one organisation. It creates a new organisational entity that is distinct from its parent organisations.	0.71
Co-development	Sharing technical, marketing or production information with business partners for purposes of new product development research. The firm acquires resources and receives new ideas for its own new product development.	0.73
Co-design	Designing products across a network of partners, improving or adding new features to the existing product line. It refers to the process of designing features and use functionality.	0.89
Co-manufacturing	Sharing manufacturing facilities for production purposes.	0.80
Aggregated purchasing	Forming buying groups with business partners to reduce the purchasing price when sourcing goods and services.	0.76
Co-logistics	Sharing logistics services or third-party transport logistics or sharing storage or warehouse facilities for purposes of efficiency or effectiveness of the firm's logistics function.	0.85
Joint problem solving	Working together and communicating with business partners for the purposes of establishing solutions to problems that affect all the partners.	0.68
Shared resources	Shared use or provision of resources within formal or informal consortia of individuals or organisations (e.g., shared ICT or shared outsourced back office).	0.71
Collaborative planning, forecasting and replenishment (CPFR)	Developing joint plans and forecasts with supply chain partners for the purposes of managing the supply chain.	0.65

[a)] Taken as a proxy indicator of SMEs with a joint corporate strategy because joint ventures are their own incorporation. Alternatively, SMEs may collaborate based on agreement terms and without a dedicated project organisation or dedicated joint incorporation.

Table 3: Retrieved results for the collaboration initiatives of India-based manufacturing SMEs

Collaboration initiative	**Yes**		**No**		**Total**	
	F	%	F	%	F	%
Joint venture	53	46.9	60	53.1	113	100.0
Co-development	27	23.9	86	76.1	113	100.0
Co-design	52	46.0	61	54.0	113	100.0
Co-manufacturing	58	51.3	55	48.7	113	100.0
Aggregated purchasing	82	72.6	31	27.4	113	100.0
Co-logistics	42	37.2	71	62.8	113	100.0
Joint problem solving	87	77.0	26	23.0	113	100.0
Shared resources	51	45.1	62	54.9	113	100.0
CPFR	87	77.1	26	23.0	113	100.0

N: 113 (that is, all the respondents who stated they have/had some kind of formal collaborative partnership).

Table 4: Type of ownership and collaborative initiatives

Collaboration initiative		Local	Foreign	Local–Foreign	Local		Foreign		Local–Foreign	
		%	%	%	CI High	CI Low	CI High	CI Low	CI High	CI Low
Joint venture	Vertical	1.5	0.0	8.9	0.04	0.01	0.00	0.00	0.14	0.04
	Horizontal	1.4	0.0	91.1	0.04	0.01	0.00	0.00	0.96	0.86
Co-development	Vertical	6.0	0.0	11.1	0.10	0.02	0.00	0.00	0.17	0.05
	Horizontal	7.5	0.0	31.3	0.12	0.03	0.00	0.00	0.40	0.23
Co-design	Vertical	22.4	100.0	13.3	0.30	0.15	1.00	1.00	0.20	0.07
	Horizontal	19.4	0.0	40.0	0.27	0.12	0.00	0.00	0.49	0.31
Co-manufacturing	Vertical	11.9	0.0	15.6	0.18	0.06	0.00	0.00	0.22	0.09
	Horizontal	41.8	0.0	44.4	0.51	0.33	0.00	0.00	0.54	0.35
Aggregated purchasing	Vertical	9.0	0.0	8.9	0.14	0.04	0.00	0.00	0.14	0.04
	Horizontal	67.2	0.0	64.4	0.76	0.59	0.00	0.00	0.73	0.56
Co-logistics	Vertical	17.9	0.0	15.6	0.25	0.11	0.00	0.00	0.22	0.09
	Horizontal	20.9	0.0	26.7	0.28	0.13	0.00	0.00	0.35	0.19
Joint problem solving	Vertical	58.2	100.0	40.0	0.67	0.49	1.00	1.00	0.49	0.31
	Horizontal	49.3	0.0	68.9	0.59	0.40	0.00	0.00	0.77	0.60
Shared resources	Vertical	9.0	100.0	6.7	0.14	0.04	1.00	1.00	0.11	0.02
	Horizontal	41.8	0.0	35.6	0.51	0.33	0.00	0.00	0.44	0.27
CPFR	Vertical	76.1	0.0	80.0	0.84	0.68	0.00	0.00	0.87	0.73
	Horizontal	1.5	0.0	0.0	0.04	0.01	0.00	0.00	0.00	0.00

CI: Confidence interval calculated at 95% for the sample.
N: 113.

Table 5: Age of SMEs and collaboration

Collaborative initiative		New	Young	Mature	New		Young		Mature	
		%	%	%	CI High	CI Low	CI High	CI Low	CI High	CI Low
Joint venture	Vertical	0.0	0.0	6.4	0.00	0.00	0.00	0.00	0.11	0.02
	Horizontal	30.0	32.0	50.0	0.38	0.22	0.41	0.23	0.59	0.41
Co-development	Vertical	0.0	4.0	10.3	0.00	0.00	0.08	0.00	0.16	0.05
	Horizontal	10.0	16.0	17.9	0.16	0.04	0.23	0.09	0.25	0.11
Co-design	Vertical	20.0	24.0	17.9	0.27	0.13	0.32	0.16	0.25	0.11
	Horizontal	30.0	28.0	27.0	0.38	0.22	0.36	0.20	0.35	0.19
Co-manufacturing	Vertical	20.0	12.2	12.8	0.27	0.13	0.18	0.06	0.19	0.07
	Horizontal	20.0	36.0	47.4	0.27	0.13	0.45	0.27	0.57	0.38
Aggregated purchasing	Vertical	10.0	8.0	9.0	0.16	0.04	0.13	0.03	0.14	0.04
	Horizontal	40.0	64.0	69.2	0.49	0.31	0.73	0.55	0.78	0.61
Co-logistics	Vertical	10.0	16.0	17.9	0.16	0.04	0.23	0.09	0.25	0.11
	Horizontal	0.0	28.0	24.9	0.00	0.00	0.36	0.20	0.33	0.17
Joint problem solving	Vertical	50.0	48.0	52.6	0.59	0.41	0.57	0.39	0.62	0.43
	Horizontal	40.0	52.0	60.3	0.49	0.31	0.61	0.43	0.69	0.51
Shared resources	Vertical	0.0	12.0	9.0	0.00	0.00	0.18	0.06	0.14	0.04
	Horizontal	50.0	44.0	35.9	0.59	0.41	0.53	0.35	0.45	0.27
CPFR	Vertical	60.0	64.0	83.3	0.69	0.51	0.73	0.55	0.90	0.76
	Horizontal	0.0	0.0	1.3	0.00	0.00	0.00	0.00	0.03	0.01

New: firm established up to 5 years before. Young: firm established 5–10 years before. Mature: firm established more than 10 years before.
N: 113.
CI: Confidence interval calculated at 95% for the sample.

Table 6: Network structure and collaboration initiatives

Collaboration initiative		S-M- %	S-M- %	S-M-D- %	S-M-W- %	S-M-R		S-M-W-R		S-M-D-R		S-M-W-D-	
						CI High	CI Low	CI High	CI Low	CI High	CI Low	CI High	CI Low
Joint venture	Vertical	19.4	0.0	0.0	3.2	0.27	0.12	0.00	0.00	0.00	0.00	0.06	0.00
	Horizontal	28.6	51.9	32.4	61.3	0.37	0.20	0.61	0.43	0.41	0.24	0.70	0.52
Co-development	Vertical	9.5	0.0	2.9	19.4	0.15	0.04	0.00	0.00	0.06	0.00	0.27	0.12
	Horizontal	9.5	18.5	17.6	19.4	0.15	0.04	0.26	0.11	0.25	0.11	0.27	0.12
Co-design	Vertical	33.3	11.1	20.6	16.1	0.42	0.25	0.17	0.05	0.28	0.13	0.23	0.09
	Horizontal	23.8	22.2	35.3	25.8	0.32	0.16	0.30	0.15	0.44	0.26	0.34	0.18
Co-manufacturing	Vertical	14.3	7.4	23.5	6.5	0.21	0.08	0.12	0.03	0.31	0.16	0.11	0.02
	Horizontal	38.1	44.4	44.1	41.9	0.47	0.29	0.54	0.35	0.53	0.35	0.51	0.33
Aggregated purchasing	Vertical	19.0	0.0	5.9	12.3	0.26	0.12	0.00	0.00	0.10	0.02	0.18	0.06
	Horizontal	57.1	74.1	67.6	61.3	0.66	0.48	0.82	0.66	0.76	0.59	0.70	0.52
Co-logistics	Vertical	19.0	14.8	8.8	25.8	0.26	0.12	0.21	0.08	0.14	0.04	0.34	0.18
	Horizontal	9.5	48.1	17.6	16.1	0.15	0.04	0.57	0.39	0.25	0.11	0.23	0.09
Joint problem solving	Vertical	66.7	40.7	55.9	45.2	0.75	0.58	0.50	0.32	0.65	0.47	0.54	0.36
	Horizontal	52.4	74.1	50.0.3	51.6	0.62	0.43	0.82	0.66	0.60	0.41	0.61	0.42
Shared resources	Vertical	14.3	3.7	5.9	12.9	0.21	0.08	0.07	0.00	0.10	0.02	0.19	0.07
	Horizontal	61.9	37.0	41.2	22.6	0.71	0.53	0.46	0.28	0.50	0.32	0.30	0.15
CPFR	Vertical	71.4	81.5	76.5	77.4	0.80	0.63	0.89	0.74	0.84	0.69	0.85	0.70
	Horizontal	4.8	0.0	0.0	0.0	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00

S: supplier. M: manufacturer. W: wholesaler. D: distributor. R: retailer.
CI: Confidence interval calculated at 95% for the sample.
N: 113.

Table 7: Collaboration and R&D intensity

Collaborative initiative		R&D Intensity**			HT/MHT		LT/MLT		Others	
		HT/MHT	LT/MLT	Others						
		%	%	%	CI High	CI Low	CI High	CI Low	CI High	CI Low
Joint venture	Vertical	60.0	20.0	20.0	0.69	0.51	0.27	0.13	0.27	0.13
	Horizontal	58.0	34.0	8.0	0.67	0.49	0.43	0.25	0.13	0.03
Co-development	Vertical	55.6	33.3	11.1	0.65	0.46	0.42	0.25	0.17	0.05
	Horizontal	68.4	26.3	5.3	0.77	0.60	0.34	0.18	0.09	0.01
Co-design	Vertical	31.8	45.5	22.7	0.40	0.23	0.55	0.36	0.30	0.15
	Horizontal	64.5	29.9	6.5	0.73	0.56	0.38	0.21	0.11	0.02
Co-manufacturing	Vertical	53.3	46.7	0.0	0.62	0.44	0.56	0.38	0.00	0.00
	Horizontal	43.8	41.7	14.6	0.53	0.35	0.51	0.33	0.21	0.08
Aggregated purchasing	Vertical	50.0	30.0	20.0	0.59	0.41	0.38	0.22	0.27	0.13
	Horizontal	40.5	51.4	8.1	0.50	0.31	0.61	0.42	0.13	0.03
Co-logistics	Vertical	63.2	31.6	5.3	0.72	0.54	0.40	0.23	0.09	0.01
	Horizontal	30.8	57.7	11.5	0.39	0.22	0.67	0.49	0.17	0.06
Joint problem solving	Vertical	46.6	41.4	12.1	0.56	0.37	0.50	0.32	0.18	0.06
	Horizontal	53.1	37.5	9.4	0.62	0.44	0.46	0.29	0.15	0.04
Shared resources	Vertical	30.0	50.0	20.0	0.38	0.22	0.59	0.41	0.27	0.13
	Horizontal	43.2	47.7	9.1	0.52	0.34	0.57	0.38	0.14	0.04
CPFR	Vertical	47.1	46.0	6.9	0.56	0.38	0.55	0.37	0.12	0.02
	Horizontal	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00

** Statistically significant (the chi-square value ranges from 10.267 to 5.033 with p ranges from .006 to .081).
CI: Confidence interval calculated at 95% for the sample.
N: 113.

Figures

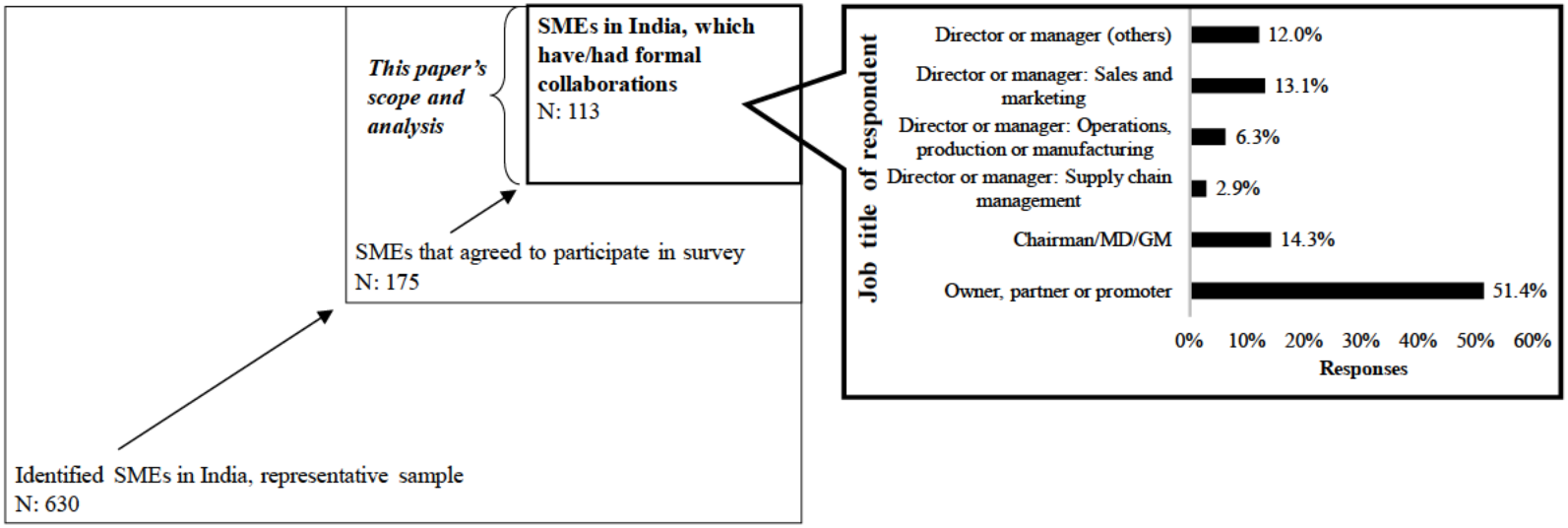

Figure 1: Respondents' profile and data sample

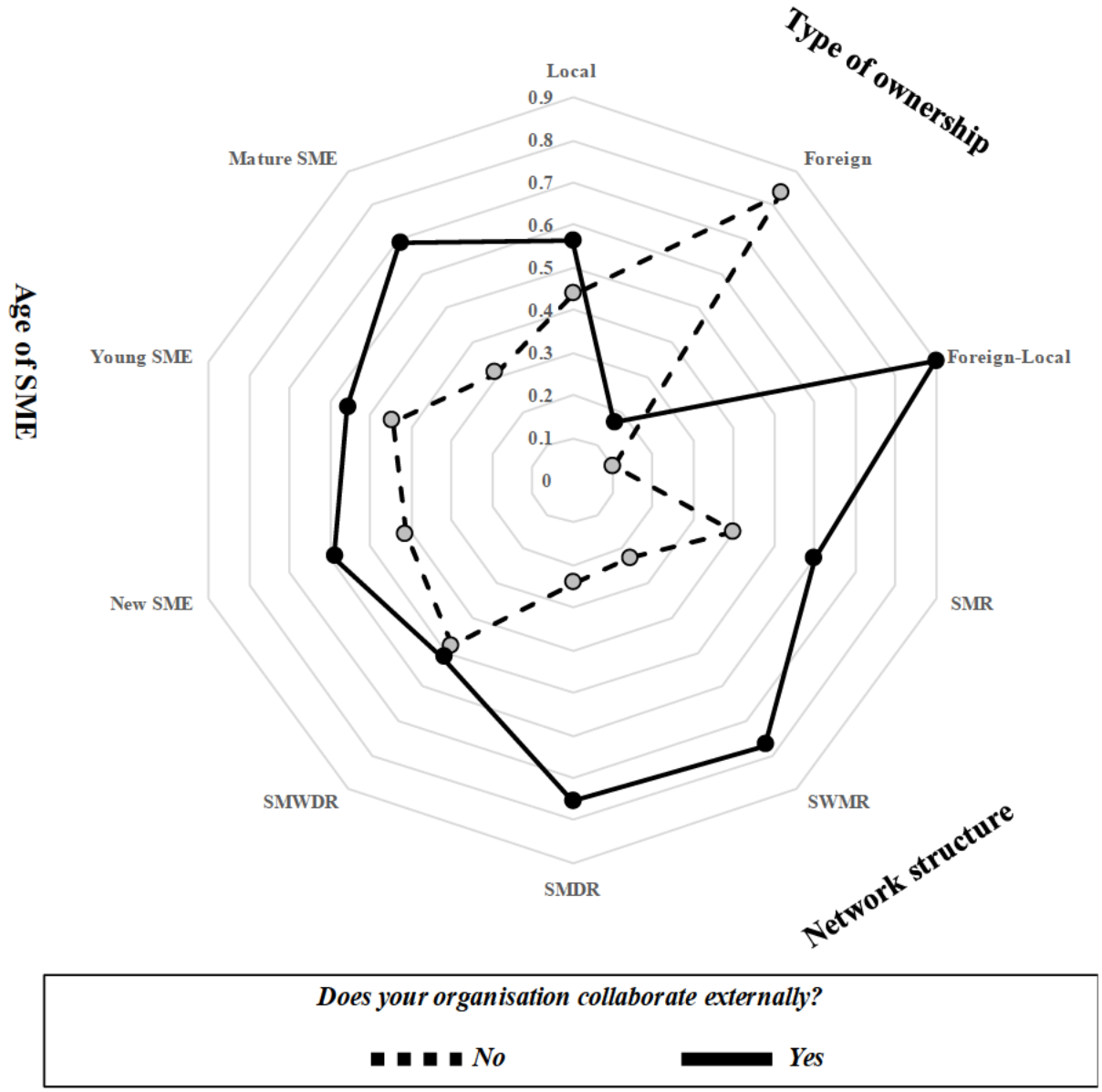

Figure 2: Respondents' collaboration profile