Production Chains: A Difficult Research Agenda

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ABSTRACT

After introducing the concept of the production chain, the paper examines the empirical findings about it in the global automobile industry. On this basis, a simple and yet exciting research problem about organizational capabilities in value creation is derived with its associated research questions. The paper then points out the difficulties the authors encountered in executing this research project, even as it still remains a worthwhile research quest to unravel how modern industrial firms create value by their choice of the nature and content of subcontracting and human resource practices.

Keywords : Production Chain, Automobile Industry, Subcontracting, HR Practices, Tiering Structure, Assemblers

INTRODUCTION : THE CONCEPT OF PRODUCTION CHAINS

Production chains are part and parcel of the broader 'value chains' which exist within and across countries. A value chain refers to "all the value adding activities in production and distribution linked together" in relation to the making and selling of a commodity (Campbell and Parisotto, 1995; Palpacuer, 1997; IILS, 1992). All the value adding activities in the making of a commodity constitute the production chain, and various firms involved in these activities are linked through subcontracting relations, wherein subcontracting means the manufacture of goods by one firm for another based on the latter's specifications (Lazerson, 1990).

A concrete sense of production chains can be obtained by reviewing some empirical studies about how they have really evolved in the global automobile industry in terms of subcontractor-structure and the nature and content of subcontracting relations.

AUTOMOTIVE PRODUCTION CHAINS

In the Japanese automotive production chain, as pointed out by Hines (1994) , at the top, there are 11 lead firms which are giants such as Toyota or Nissan employing many thousands of people each. These lead firms are supplied by first-tier, large subcontractors typically employing 300 to 1000 employees, although there are a number of significantly larger firms such as Nippondenso. There are around 200 to 300 such first-tier subcontractors per final assembler (lead firm) and these provide sub-assemblies or systems. These companies, in some instances, are owned, partly owned or have a minor equity stake from one or more of their lead firms. They can, therefore, be classified as affiliated (where no one lead firm owns more than 30 per cent) or independent. The first-tier subcontractors are supplied by a larger number of second-tier subcontractors providing them with sub-assemblies such as metal pressings welded together and subsequently processed, for instance, by painting. Each of the first-tier subcontractors has in the region 25-30 of these second-tier subcontractors. The latter are typically small-medium in size employing 10 to 300 people. These second-tier subcontractors have their own subcontractors who provide them with specialist process abilities such as plating, casting and machining. These are typically very small with fewer than ten employees and are required to be extremely flexible in their work. Each second-tier subcontractor may retain the services of six to ten of these third-tier subcontractors. There may even be fourth and fifth tier subcontractors depending on the type of product and specialism required. Within this tiering structure, it is the responsibility of the lead firms (the customer tier) to organize, communicate and nurture the level below. Thus, the lead firms deal only with the first-tier subcontractors; the first-tier subcontractors deal with the second-tier ones and so on down the hierarchy. On aggregating the pyramidal production chains of all the lead firms in the automotive industry, the resulting formation looks like a series

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of mountain peaks, and this is called the "Alps Structure" of production chains in the Japanese motor vehicle industry.
In Germany, the subcontracting hierarchy ranges from first and second levels of subcontracting involving small, medium and large firms and goes down to homework on contract in peripheral areas. The 'old' Federal Republic of Germany, with its roughly 3600 component supply firms that employ a workforce of some 780000, is the most relevant supply country within the European Union. Among them, there are some 15 firms with JIT production and delivery capabilities; they produce and deliver complete seats, door modules or bumper systems in sequences of 20 minutes. There are about 800 to 1000 JIT firms, which produce and deliver on daily schedules. Finally, there are some 2600 to 2800 traditional component suppliers with irregular production and delivery schedules (see Doleschal in Tokunaga eds., 1992).
Posthuma (1997) illustrated the multiplicity of sourcing relations between the lead firms and the subcontractors who emerged in late 1990s in the Brazilian motor vehicle production chains. First, more demanding standards of price, quality and delivery eliminated some firms from their former relationship as direct subcontractors. In such a situation, the discarded subcontractors either closed down, or re-positioned themselves within a less demanding market, either by moving further down the automotive production chain or by transferring to another sector. Secondly, the automotive assemblers increased outsourcing of some processes (primarily in services such as cleaning, security and food services, and also in productive activities) in order to cut costs, reduce peripheral activities and focus upon their most profitable activities. In this case, the assembler was concerned to free itself of certain operations, which were normally low-technology and low value-added operations. Thirdly, the traditional price-based model of contract bidding, whereby the assembler solicited bids from several subcontractors for the same part in order to force down prices, was widely used as a common practice, despite the fashionable management discourse that price-based competition is no longer appropriate in an environment where producers must cooperate increasingly. This "arm's length" relationship did not involve much technical or informational exchange between the assembler and the subcontractor - rather, the subcontractor merely fulfilled the basic production and delivery functions within the new range of responsibilities and requirements of the assemblers. Fourthly, imports of parts and fully-assembled vehicles rose rapidly in the 1990s, with the assemblers' increased ability to buy parts on a global basis, in accordance with their need for lower-cost or more technologically sophisticated components. Finally, a 'partnership' relationship existed between the assembler and first-tier subcontractors in terms of close collaboration, information exchange, joint project development, and more stable relationship.
The first-tier subcontractors were becoming assemblers in their own right as they took on greater responsibilities for administering the production chain and supplying sub-systems. They replicated the same five sourcing ways, as mentioned above, with their second and third-tier subcontractors. The partnership relationship did not eliminate conflict between the assemblers and the first-tier subcontractors; in fact, as the first-line subcontractors were forced to accept greater direct costs and risks than before, even as they were pressurized continuously for price reductions, the tension between assemblers and first-line subcontractors aggravated.
Posthuma (ibid.) pointed out that while the Japanese or Toyota model of subcontracting relations was already well-diffused within the Brazilian automotive industry, there was also an amazing new development which could turn out to be the new benchmark best practice. This was the "Lopez Model" of assembler-supplier relations, named after the controversial Volkswagen executive who moved out of General Motors into the Volkswagen truck and bus factory in Resende, a Rio de Janeiro state, and implemented this daring model for the first time in the world. This model, like the Toyota model, relies on a reduced supply base and the formation of close relationships with first-tier suppliers, but it goes a step beyond the Toyota model in that a select group of seven first-tier suppliers of subassemblies work inside the final assembly factory. Each subcontractor is responsible for a special module or system- a complex subassembly of the final vehicle. These module specialist firms take the responsibility for managing the entire production chain associated with their respective modules - paid employees who work inside Volkswagen's factory and prepare the entire module subassembly and are responsible for the defect-free installation of the module onto the vehicle as it passes on the assembly line. In this scenario, the lead firm plays the role of a designer, general overseer of the process and commercializer, and passes over the production, subassembly and even final assembly to its first-tier suppliers. The plant is divided into seven modules, each one is responsible for an entire subassembly unit like motor, chassis, suspension, cabin, painting, wheels and carpeting. Each company (or consortium of companies) is responsible for a module which has its own employees working inside the Volkswagen factory and who are also responsible for the layout of the process, organization of the production chain and logistics of the module. Each module team is

responsible for the quality of the module and its final assembly. These seven module subcontractors participate financially in partly bearing the financial costs of the factory's construction. No module subcontractor is paid until the final vehicle is approved, and it leaves the plant defect-free. This only demonstrates the added risk which subcontractors are forced to accept if they wish to work in 'partnership' with the lead firm. Other automakers are also found copycatting this model of subcontracting. For example, Ford do Brasil introduced an "industrial condominium" model, wherein suppliers of wheel systems, seats, electrical systems and paint supply all operate within the lead firm's factory to deliver and assemble sub-systems. The General Motors' Blue Macaw project in Brazil, wherein GM's suppliers are literally following the lead firm inside the shop, is another similar trend-setting example. Chrysler has done the same in Brazil as well as in America. It is now well-known that new techniques of vehicle manufacturing, which are creating a revolution are not being developed in the USA or Germany or Japan, but in Brazil. Thus, this "salsa" way of car making is the latest benchmark in car making and the subcontracting arrangements therein (Gangwar, 1999).

In Mexico, Ford also introduced the model of integrating select first-tier subcontractors into the main factory, in its famous Mexican plant, Ford Hermosillo. In a fascinating write-up about how suppliers comply to the assemblers' requirements in Mexico (Ramirez, 1993), it can be seen how this famous assembly plant imposed delivery requirements, which vary according to four categories of subcontractors: **(a)** Suppliers JIT, who make two deliveries a day and are located near the plant; **(b)** Total Responsibility Suppliers, who apart from performing the role of suppliers JIT, jointly work with the lead firm on the assembly lines; **(c)** National Suppliers and **(d)** International Suppliers. Deliveries from the latter two types of suppliers are ensured by delivery every 7 or 10 days of the quantities of products required daily during a 7 day or 10-day period. These are stored in local warehouses and then delivered to the lead firm in one-day batches. This is known as one-day-at-a-time JIT, which mimics JIT delivery. With regard to the former two types of suppliers, there exists a high level of synchronization between them and the lead firm. And in this synchronization, any deviation from original specifications means severe punishments for suppliers - $20,000 penalty per minute if the assembly line is stopped by a supplier's error.

In China, where the automobile industry is growing most rapidly and whose expected exports of vehicles and components are expected to be extremely disruptive to the industry elsewhere, Brandt and van Biesebroeck (2006) found, as part of the International Motor Vehicle Project, that the supply chain in the industry has taken on a tiered format: "Original equipment manufacturers (OEMs) design the vehicles and are involved in most of the engineering work. For the important modules in the vehicle (braking system, wiring harness, interior), they will select a first-tier supplier who will work with them to develop the module and coordinate design, production and logistics to the assembly plant. In turn, these first-tier suppliers will select second-tier suppliers, who will be in charge of smaller parts, and so on. Given the interrelatedness of all the parts, it is no surprise that the OEM wants to have some say in the firms selected further upstream and that activities at each level in the supply chain are coordinated very intensely with activities at the level above and below."

In Korea, where the automobile industry, led by mini-giants such as Hyundai and Kia, has made rapid progress, the lead firms obtain individual components directly or through a two-layered subcontracting system (Shridharan, 1999). The Japanese style tiered structure of subcontracting was certainly not there under the lead firms in India in the early 1990s, although it is said that such a trend was just beginning in respect of a fairly large cross-section of Indian industrial organizations in the engineering and automobile industries, even as the Confederation of Indian Industries and the Automotive Component Manufacturers Association went about popularizing the lean philosophy through annual quality summits and periodic workshops and conferences on "best practices in workplace quality and productivity" and "emulating world-class practices" as also publications, including newsletters such as "Quality News" (CII, 1994; 1996; 1997;1998; CII, Undated). However, the late 1990s saw a novel experiment unfold in the Indian auto-component industry with Tata Sons attempting to tierize the subcontracting industry with the formation of a company called Tata Auto Comp Systems (TACO) at Pune. The researchers came to know that this company has entered into joint ventures with ten companies to produce state-of-the art sub-assemblies for the global market. These tier one firms would source from a set of tier two firms, which would be predominantly Indian in ownership. TACO planned to hold a 50 per cent share in tier one companies and would provide some equity and lot of technical know-how to tier two firms. Apart from providing standardization to auto components and sub-assembly production in India, this would give a structure to the highly fragmented auto component industry in India with the presence of a

world-class player at the top of the tier (Basant et al., 1999). It may be noted that the Indian auto component industry is being written up as the next industry, after software, that has the potential of becoming globally competitive. And in this regard, efforts are being made to disseminate the lean production philosophy in the industry, which is said to be rapidly adopting elements of lean manufacturing, including the Japanese style subcontracting practices. While TACO is seen as a quintessential example of the rise of the auto component industry based on lean production, it may be noted that by late 1990s, it was found that a three-tiered subcontracting system was commonly found under the big exporting firms in three auto component clusters in India, viz. the Bangalore-Chennai-Coimbatore cluster in South India, the Delhi-Faridabad-Gurgaon cluster in North India, and the Pune cluster in Western India (ITC, 1998). According to this study, the extent of subcontracting varies from product to product and depends largely on the policies of the exporting firm. Product sophistication plays an important role as well. For example, in the production of brake systems, the exporting firm subcontracts major sub-assemblies such as slack adjusters, etc. to medium-sized firms. These firms then subcontract out to smaller firms for the production of sub-components such as cover plates, worm shafts, activator valves, etc. These firms further subcontract out to smaller units involved in the fabrication of tools, jigs, fixtures and dies. Some export firms have their first-line subcontractors who may commission specialized firms to conduct grinding, milling or heat treatment processes. The third tier would involve simple activities such as electroplating and powder coating.

ITC (ibid.) further found that linkages for subcontracting processes and products are generally established with small-scale units, except for a number of vital components and certain processes that require high levels of capital investment. Heat treatment is one such process; it requires a significant initial start-up cost and thus, generally takes place in medium-sized rather than small - sized units. In most cases, the small and medium units working as subcontractors are independent family-owned concerns. However, instances also exist where export firms outsource their requirements to small units with the same corporate umbrella in order to safeguard the product design as well as to ensure high quality of sub-components. The most basic components such as nuts, bolts and rivets are made by very small units employing less than 10 workers. These tiny units are not covered by the Factories Act, and they belong to the urban informal sector. Such units employ second-hand and repaired machines and have no quality inspection systems. Wages are extremely low with no social security and insurance benefits. The number of such units is large, employing a significant proportion of workers in the auto components industry, but data on their location as also work patterns are largely unavailable.

There seems to be no three-tier subcontracting in the Punjab (Jalandhar-Ludhiana-Phagwara) auto parts and components cluster in North West India. The first-tier subcontractors catering to the requirements of OEMs and exporters have highly sophisticated integrated factories, which sporadically subcontract out to specialized job-work units in the unorganized sector, a majority of which operate with two or three machines and do jobs like chamfering, facing, cotter slotting, stamping, heat treatment, induction hardening, plating, etc. (Awasthi et al., 2010).

However, in the South Indian Tamil Nadu auto-components cluster - the Chennai cluster - there is a distinct vertically integrated pyramid in which around a hundred large and medium sophisticated firms dominate the vertical supply chain. They produce for supply to overseas firms or OEMs within the country. At the lowest tier lie the small and tiny enterprises numbering around 8000 units, which form slum-like clusters. In between are the second-tier or third-tier firms which work as intermediary subcontractors (Suresh, 2010). Cost cutting pressures from the internal as also external assemblers have been pushed down the pyramidal subcontracting chain. The first-line subcontractors have reorganized themselves in terms of lean production; they have also upgraded themselves technologically through labour displacing automation, which has reduced labour costs by offloading skilled workers as the CNC machines (for cutting, drilling, etc.) came into the factories. Smaller firms have been eliminated from getting direct contracts from the OEMs, which have reduced their supply base. The first-line subcontractors have increasingly subcontracted out production to lower tier firms - small and tiny enterprises of light engineering industries. As the intermediary subcontracting firms pass on the subcontract business to these tiny firms, the lower-tier firms "do not receive the price that the OEMs pay for these products. The intermediary firms appropriate a large share of profits through a variety of methods. First, they fix a very low price for the work outsourced. Sometimes, the price diminishes in value from the time of contract to that of delivery. This fluctuation is often created artificially by using a variety of unfair practices. The intermediate firms regularly create long time gaps between delivery from and cash payments to the small firms. These delayed payments severely affect the functioning of the micro units as their capital base is too weak to offset such crises arising from delayed money flows" (ibid., p.261).

The diffusion of new production practices and subcontracting relations integral to lean philosophy in the South Indian auto-component firms has been hailed as the auto-industry rapidly learning to "KISS" - 'Keep It Simple, Stupid' (Ramesh, 1998). The same was said to be holding good in North India, with the lead taken by lead firms such as the Eicher Group in collaboration with Mitsubishi, apart from Maruti-Suzuki and Hero Honda, and many component firms with foreign collaboration, such as Motherson Sumi, Shri Ram Pistons and Rings, Sona Steering, Sanden Vikas, etc. The modernization of the Indian auto-components industry in terms of financing private sector investments to beat the competition with quality was undertaken by the International Finance Corporation of the World Bank through its India Auto Ancillary Fund. It is evident that the Indian auto-components industry, with its alleged tremendous growth potential due to the cost-competitive nature of the industry, cannot, however, escape from the agenda of lean production to "improve the consistency and quality of products in order to compete better with other countries vying for the global sourcing in the automotive industry" (Muralidhar, 1997).

Manufacturing synchronization with the subcontractors is a capitalist imperative to reduce costs. This means: "Try and get the supplier to manufacture at the same rate that the lead firm does; to deliver every day just what the lead firm wants every day. Not just from stock, but also from production: make the product every day. And then, buy from your subcontractors every day, and get your suppliers to make every day so that the time it takes to pass through all these steps is dramatically reduced. At each point, you are not making to forecast; you are making to actual demand. You are making to the next day's requirement - not the next month's guesstimate....If the 60 per cent, or the 70 or 80 per cent (of value) that you buy from your suppliers is inefficiently done, you suffer from their problems. So, it is necessary to extend the synchronization all the way back down the supply chain if you really want to spread the benefits across more of the total costs of the car. That's why supply chain synchronization and supply-chain management, right down to the second- and third-tier suppliers, become necessary. Toyota spent 20 years teaching its first- and second-tier suppliers, gradually pushing the lean logic as far down the chain as possible" (Jones, 1997).

This sounds great, but we do not know if this JIT production along with TQM practices is undertaken by all the first-tier subcontractors and the subcontractors below them, although JIT deliveries are said to be made by them. Studies on the diffusion of lean thinking in the US suggest that lean thinking is not easy to implement (see Liker ed., 1998). Even in Japan, little or no evidence is available about the operation of JIT in the Japanese supply chains. Research on the subcontractors and sub-subcontractors suggests that JIT at the lead firms causes "Japanese induced terror" in terms of many problems, much to the disadvantage of the subcontractors, especially of the burden of inventory holdings transferred from the lead firm- the powerful partner in the subcontracting relationship - to the subcontractors and the sub-subcontractors. It is also not clear to what extent the total quality practices such as Statistical Process Control (SPC) have filtered up the supply chain (Roper et al., 1997; Rainnie, 1991; Thomas and Oliver, 1991). Those who have examined the diffusion of TQM in the vertical supply chain suggest that final inspection continues to be the major approach to quality among the component subcontractors, although it is now well established to be detrimental to quality and cost, and that the lack of awareness as also adoption of SPC - (see GM-Ford-Chrysler, 1992) - and quality control tools is a matter of concern since without these two, it is virtually impossible to achieve consistent quality (Basant et al., 1999; Posthuma, 1991; Humphrey et al., 1998). Manufacturing techniques such as 'cellular manufacturing' are said to be relevant in enterprises employing 50-100 people, but we are in the dark if the small sector with such employment range is adopting those techniques. Similarly, decentralized solutions to quality assurance are unlikely to be found in small-medium firms, simply because all over the world, the production process is not worker-led in small-medium firms; quality assurance functions are not integrated in the production area but are transferred to specialized and skilled personnel like production managers/engineers/supervisors/foremen.There are neo-tayloristic practices like quality technicians verifying production work without SPC being used.

To sum up, as regards the subcontractor-structure in the production chains emanating from the global lead firms, the latest trend-setting finding seems to be that the relationship between the main firms and their subcontractors has been redefined with the creation of a hierarchical vertical three-tiered structure. However, the trend-setting patterns in the nature and content of the subcontracting relations have not yet been empirically established in different contexts despite the distinction made between the old and the new practices in terms of the 'exit relations' or 'arm's length contractual relations' on the one hand and the 'voice relations' or 'obligated contractual relations' , wherein the former relationship refers to a lead firm having a problem with a subcontractor finds a new subcontractor and the latter relationship refers to the lead firm closely working with the original subcontractor to resolve the problem (Helper, 1991; Humphrey et al., 1998). The latter relationship is one of tapping the gold in the subcontractors, so to say.

Similarly, the nature and content of the employment relationship in the top to the bottom of the production chain has not yet been thoroughly researched, although the tipsy hypothesis here is that in seeking competitiveness, the employers will tap the gold in the heads of the workers by treating labour as an asset, and not as just another manufacturing input, by means of offering employment stability, training programmes for skills enhancement, participative management and worker empowerment, adequate pay and good working conditions, and good labour-management relations without violation of labour rights. This hypothesis, like the hypothesis of voice supplier relations, may not hold good for subcontractors down the production chain from the Tier 2 level.

A SIMPLE RESEARCH PROBLEM

A brief literature survey as above concerning production chains in the global auto industry can now be distilled into a concise research problem as follows. If we ask the question as to how modern industrial firms create value, i.e. how do they produce high-quality products at low unit costs in the open economy environment that subjects them to intensified competitive pressures, then we need to answer this question by way of finding out how modern industrial firms create and manage commodity/value chains; especially, we need to understand how they use manufacturing strategies to upgrade or streamline the production chain part of it that encompasses subcontracting relations between the lead firms and a wide range of large, medium, small and tiny firms. This investigation, thus, also opens the doors to understanding what kind of HR practices are found in creating value within and across firms involved in creating a complex, mass produced end-product like a motor vehicle.

Accordingly, there are four context- specific research questions associated with this research problem, which are as follows: **(a)** What can be discovered in terms of the subcontractor-structure of a production chain? And as we go down the production chain from the lead firms at the top to the subcontractors at the bottom, what can be discovered : **(b)** With regard to the model of subcontracting relations that is in place?, and **(c)** With regard to the five sets of human resource practices, viz., **(i)** Work organization and worker participation; **(ii)** Employment security and labour arrangements (staffing practices); **(iii)** Wages, non-wage benefits and working conditions; **(iv)** Skills, training and motivation; and **(v)** Enterprise governance and labour-management relations; and finally, **(d)** how are the human resource practices influenced by the nature and content of subcontracting practices between firms?

DIFFICULT TO SOLVE

The research strategy adopted by the researchers to answer the above questions was to combine the method of mailed questionnaires to solicit the relevant information from nationwide lead and subcontracting companies, with the direct inductive approach in terms of the qualitative method of fieldwork, which facilitates anthropological nearness to the factory people who matter as informants in the industrial landscape of Gurgaon, near Delhi. The researchers sought to do fieldwork based on neither single case (enterprise) nor a large survey of enterprises, but on a reasonably large number of multiple cases (around 20) - at each level in the production chain - from which primary information - qualitative and quantitative - could be gathered through multiple methods by way of open-ended interviews, semi-ethnographic observations, and semi-structured questionnaires in relation to workers and managers of the auto companies in Gurgaon. The unit of analysis was, of course, the business organization in terms of its factory because it is, after all, business organizations which make decisions regarding capital investments, manufacturing techniques, union or non-union labour contracts, creation or elimination of jobs, work organization and governance, reward or incentive systems, etc. (Kalleberg, 1990).

However, the researchers' hopes and expectations in executing this research strategy turned out to be wishful thinking due to the following problems they encountered.

The researchers mailed the questionnaire (for employers) to all auto assemblers in India to see who would support their research project. None replied positively. Similarly, none responded to their mailed questionnaire, which was despatched to all the medium and large auto component firms listed in the *Indian Automative Industry Buyers' Guide* as brought out by the Automotive Components Manufacturers Association (ACMA). Then, the researchers got hold of a list of auto-component firms via the Gurgaon Industrial Directory, from the Gurgaon Industrial Association, but none of them replied to their questionnaire. Hence, the researchers concluded that the method of mailed questionnaires is utterly useless in the Indian context.

A lot of time and money of the researchers was wasted in commuting very long distances and contacting the top/middle management of Maruti-Suzuki in the Delhi NCR region in vain. Supply chain human resource managers generally avoid researchers, as it happened in this case. At many sites, the personnel managers came up to the security post, told the researchers to give a written application and promised to call back, but there was no response later on. The officials at ACMA, New Delhi were of no help in facilitating access to the enterprises. Factory/labour inspectors too did not open up. Getting a list of vendors directly from the lead companies, and of the sub-vendors from the vendors turned out to be impossible as they do not disclose even two or three names. And searching for enterprises in the lower end of the production chain was like literally walking through the wilderness. The researchers could make some contacts with managers in auto subcontract companies at the Tiers 1 and 2 levels by meeting them at the Management Development Institute (MDI), Gurgaon, where they were pursuing a part-time MBA. Some of these managers revealed about the existence of three or four tiered subcontracting structure in Delhi/ NCR, but did not have the time to respond to the questions of this research project.

The researchers, before embarking on the fieldwork, were unaware that supplier and human-resource practices are too sensitive an issue, like sexual matters of privacy such as the AIDS disease, for employers and their managers to talk about, although Lee (1993) said that it is better to learn to manage sensitive issues than to avoid them by pursuing only safe lines of research. The point is that learning by doing in this regard can be very costly, as it was in the researchers' case.

More importantly, the comprehensive fabrication of the questionnaires, which was driven by the literature the researchers had read, turned out to be a barrier in that the questionnaires were very long and nobody could spare time to provide the information accordingly. Further, the researchers found that most of the respondents were unable to respond to their lean manufacturing terminology based questions and this made the researchers wonder about what kind of questions to ask or even how to frame the questions properly. In many cases, the employers were not just secretive, but outright hostile. The truth is that each factory was like a prison safe-guarded by security guards, and it was impossible to go beyond them into the factory premises. Delphi, which is said to be the largest auto parts producer in the world, much bigger than many final assemblers, and which is also present in Gurgaon, provides an "Operating Manual" to its employees in which under Working Discipline/Code of Conduct while on Duty, the company lists out 116 ways of employee behavior that could draw the vindictive attention of the company, among which there are two listings, which are as follows: "30) Disclosing to any unauthorized person(s) any information in regard to the working or process of the industrial establishment which comes into the possession of the worker during the course of his/her work. 87) Taking photographs or giving information to any unauthorized person/persons about the factory building or any plant or machinery or any compartment or part thereof or section or office without obtaining prior written permission of the management or the manager." No wonder the employees of this company were so afraid of entertaining researchers like the authors of the present study!

The researchers tried to interview some workers in public parks, at the tea shops close to factories, at the 'dhabas' and other odd places, but the workers were in a hurry most of the time. At some factories, during the short break time that was given, hundreds of workers rushed out to nearby shops for a smoke or to grab a bite and soon, rushed back into the factories in a frenzy like a pack of conditioned animals, and it was impossible to eye, leave alone, meet them! A problem with worker interviews is that most of the workers, even the ones with ITI (Industrial Training Institute) qualifications, are not articulate about the labour process in their factories and most of them are unacquainted with technical terms of Taylorism/Fordism and JIT/TQM. Another problem is that at times, they are given to hyperbole about their exploitation without any or much substantiation.

Workers were not spontaneous in talking about their factories also due to fear that persists because of some common legendary stories in Gurgaon about gun shoot-outs in some factories or some notorious gun-toting employers, or the unreported cases of workers or their leaders getting beaten up or lynched or killed inside and/or outside some factories, sometimes even in big factories such as Maruti-Suzuki's, which have become part of their collective sharing and memory. Some workers outrightly avoided the researchers, by mistaking them to be the secret agents of their managers!

On the whole, there is no culture of entertaining researchers in Gurgaon which has seen a lot of labour unrest not only in main companies, but also in subcontracting companies in the last 12 years. If managers and engineers do not entertain researchers, then how can researchers/academicians gather information about how businesses are really carried out?

CONCLUDING REMARKS

As Faculty of Economics, the researchers felt disenchanted with mainstream economic theory, which provides little help in even making a beginning to understand how modern industrial firms create value due to its overwhelming concern with developing a theory of value and exchange, rather than a theory of production (by which value is created) and distribution. Only the production chain framework - involving inter-enterprise subcontracting relations and exploration of the black box relating to intra-firm decision making and implementation processes with regard to manufacturing and employment (Leibenstein, 1989; Wood ed., 1989) - can pave the path for the researchers to explore the right answers to the grand hypothesis that modern industrial firms seek competitive advantage in value creation by means of sorting out their management of organizational capabilities in subcontracting relations as also human resource practices (Lazonick and Mass eds., 1995). The new field within economics which is known as "Organizational Economics" - the study of the design of firms' organizational and financial structures - may be of some relevance, especially in figuring out how incentives can be structured within firms (McKenzie and Lee, 2006). However, again, this new field of economics based on neo-classical micro economic theory would be a useless tinsel if it is not "grounded theory" based on real-world inside-factory data in the sense that Glaser and Strauss (1967) wanted theorization to be, and also, if it is not circumscribed by analysis of politics of production as, for example, Edwards and Wajcman (2005) do.

On this understanding and inspired by the late Prof. C.S. Venkata Ratnam of the International Management Institute, New Delhi, who acted as the researchers' informal guide, the researchers embarked on fieldwork investigations in Gurgaon in the year 2009. The researchers thought that the free time they had in summer and winter vacations would suffice to execute the research project in a time-frame of two or three years. However, due to the problems that have been elucidated above, the project could not succeed. As such, as a final reflection out of experiential learning, the researchers felt that this kind of study is very risky and cannot and should not be undertaken by university academicians on a part-time basis and without a big budget and key contacts with industrial houses/ top managements in the business world. The problem with employer support is that while it may facilitate finding out managerial concerns and perspectives, it may not facilitate finding out workers' concerns and perspectives. So, there is no alternative to roughing it out in the field to get spontaneous worker interviews. It is very important to note in this regard what Bruno and Jordan (2002) pointed out - that there exists a fundamental contradiction between the discourse of lean production as spoken by the management, for example, at Mitsubishi Motors in USA and the experiences of the workers working within that discourse. More generally, it is important to note that the subject of industrial relations itself was rewritten in the work of Noon and Blyton (2002), which was an attempt at comprehensively understanding work from the employees' perspective. Thus, workers' and managerial perspectives need to be generated and compared to discern the truth about what's happening inside factories in relation to how value is created through cooperation and conflict between main units and subcontracting units, and between employers and workers, all in the production chain.

The researchers hope that a team of business school professors and students interested in studying the interactions among business, manufacturing and human resource strategies and with a big budget may produce better research output in this regard in a short span of time (one year continuously) through better access to enterprises. If researchers and academicians cannot throw light on this topic, then who will? And then, how can knowledge about value creation expand without real world case materials generated on these lines is a question that remains to be answered.

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