

# An Emerging Picture of the Innovative Potential and Collaborative Capacity (IP/CC) Among Indian ICT Companies

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## Working Paper 3

### An emerging picture of the Innovative Potential and Collaborative Capacity (IP/CC) among Indian ICT companies

By

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#### Introduction

In any type of inquiry, the choice of the instrument for inquiry is critical to the outcome of research. In our case once we had addressed the base line, created a valid base line to start engaging with the set of companies vetted by 5 regional expert groups we were now in the position to launch the survey. The survey was launched on the 1<sup>st</sup> of May and concluded on the 30th of September 2009. The purpose of this chapter is to first explain the survey instrument, in terms of how we went about conducting the survey. Then we will present some data and discuss the findings in an inductive manner. Meaning we will not presuppose or superimpose our understanding of what should be the levels of ICT innovation in India but instead engage with the data to provide insight to how the data could be interpreted. This is to our mind a more useful approach than engaging with the data from the standpoint of standards and comparisons. In section 2 we will describe the surveys intent and its logistical operation. In section 3, we will discuss the questioner itself, in Section 4 we will talk about problems of conducting a web based survey in India, what future investigations might want to learn from our experience. In section 5 we present the data using our established framework of innovative potential and collaborative capacity. In section 6, we will analyze the data presented in the previous section. In section 7 we will discuss some of the implications of the data and conclude with section 8. Let me remind the reader, the tables and charts that we present here is in no way comprehensive but just a snapshot of the most interesting aspect of the data and more importantly which lends itself to interesting interpretation.

#### 2 Describing the operational aspects of the survey

We had two challenges to overcome in trying to study the ICT innovative landscape in India, the first arose from its geographical vastness. Implying we needed to look at India in terms of regions not for data analysis but for managing the study. Second, was related to constructing regional teams and their responsibilities. The first challenge we solved by considering five geographical regions as study operational units. This meant that these regions would be allocated an area of operation within which they will have operational freedom and funds to engage in the study. We came up with five regions, The northern region consisted of the NCR (National capital region, Punjab, Himachal Pradesh, Haryana, Western UP, Madhya Pradesh, and Rajasthan) The eastern region consisted of (West Bangle, Bihar, Orissa, Assam and the North East) the south east consisted of (Tamil Nadu) the south consisted of (Karnataka) the west consisted of (Maharashtra, Andhra Pradesh, Karalla, Goa, Gujarat).

The second challenge was a bit more intractable, for those teams we were engaging were senior people and we did not expect them to engage in supporting the survey. In effect we realized that the job of survey support needed to be done by someone else other than the team leader of the region. In some cases we were able to make the distinction of roles and constituted two teams within the region, one taking care of the survey support and the other in charge of the survey analysis and the interview, with the regional team leader still in charge of the overall work. The role of the survey support team was to use the list of the companies vetted by the expert groups for their region. Identify the companies, acquire the phone numbers and e-mail ID of management as well as the project manager for each company. Engage with them in getting their acceptance for taking part in the survey and then have the web survey particulars sent to them in a e-mail.

Once both the managers and the project managers had received the mail, it was up to the survey support to call them regularly to encourage them to do the survey. If in any case they had questions, then the survey team was to get in touch with the survey manager, in terms of operational challenges and in touch with the Copenhagen team in terms of conceptual or content clarifications. Each of the survey support team worked with relative success. The model that worked the best was when we delinked the survey support from interview, gave the responsibility of the interviews to a regional team and give the reasonability for the survey support to a start up firm. This was in my mind a successful combination and this was done in the most crucial geographical region, the South. In other cases we went with the older model of asking the regional team leader to do all the work, meaning survey monitoring, support and interviews. This to my experience was not that successful a model.

### **3 Discussing the questioner**

In order to conduct the survey we first engaged in a wide literature review of the innovation data. By the end of 2008 we had developed a table of the possible questions and hypothesis that we might want to explore, for a detail consideration of the questions and hypothesis see appendix 3 for a listing. We then reviewed the existing survey instruments already employed by the European Commission innovation study and considered the Frascati and Oslo manuals on R&D and innovation. The purpose was to draw from these survey instruments so as to make our own survey useful at a later stage for analysis and comparison and to build on these surveys. While we found these survey manuals useful, in terms of standard industry codes, nature of question dedicated to R&D, we realized these survey instruments needed to be expanded with additional questions focusing on ICT innovation.

To develop the survey instrument we engaged with the subject matter from two perspectives, the enterprise level and the project level. We decided to survey a person from the management and from the project management team because we wanted an Innovative perspective from both angles, top down and bottom up. This way we expected to capture in some detail the instance of innovation as witnessed by the manager and the project manager.

The questioner targeted to the management was referred to as the enterprise survey and project survey addressed the project manager. We decided to use a web environment for conducting the

survey and identified Survey Monkey as the platform for running the survey. The survey was launched on the 1<sup>st</sup> of May 2009 and concluded on the 30<sup>th</sup> of September 2009. Each set of questioner started with some background questions. The purpose of these questions was to capture the general data, which is necessary to tag each company. We then divided the enterprise and project level questioner into ten sections;

- A. Background firm data
- B. Product (good or service) innovation
- C. Process innovation
- D. Innovation activities and expenditures for process and product innovations
- E. Sources of information and co-operation for innovation activities
- F. Innovation objectives during 2006-2008
- G. Organizational innovation
- H. Marketing innovation
- I. Innovations with environmental benefits
- J. Research and development activities in your enterprise
- K. Basic economic information on your enterprise (including all subsidiaries and branches in all locations, national and global)

Project level questions addressed the following:

1. Company and interviewee background.
2. Innovation nature: Output; product/process innovation; market launch; business line, sectors, core IT technology;
3. Individual level: Role of interviewee in innovation process, scale of inputs in project; process of project, sources of information; co-operation partners, nature of cooperation, cost structure of project, in general in company, and the ideal for their innovation;
4. Innovation impact: influence factors rated; innovation value added impact, IPR results;
5. Project management (incentives, reporting, relationships);
6. Company level: Competency policy; latitude of methods; company incentives; work force composition; recruitment; training; idea capturing; policy and objectives of cooperation; technology procurement.

### **3.1 Pilot project**

Before we launched the main survey we conducted a pilot project using the survey instrument in two regions of India, we identified the NCR region and Mumbai, Maharashtra for the pilot project. For two reasons, our logistical teams were established in these regions and that these regions were easily accessible. The pilot project was launched during the second week of April and ended towards the end of April. Two key issues arose. First, we realized that the section on finance was not being answered so we decided to take it out of the study. Second, we decided to make the sentence simpler and shorter for our audience and to make clear the numbering system.

## **4 Problems and challenges of conducting a large-scale web based questioner in India**

Before we launched the survey, we conducted workshops in each of the regional team headquarters. We did this for two purposes, one we wanted to understand the comfort level of the people for the web survey and the other we wanted to understand the diffusion of technology, meaning since we were operating from a set of assumptions, such as, the broad availability of broadband technology, the accessibility of our target to computers and the level of English proficiency, meaning their ability to comprehend the question.

On the broadband availability the indication we received was encouraging, meaning that we were told that it would not be a critical area of concern because all of the companies we intended to survey were IT companies and all of them were expected to have broadband internet connection. On the issue of their proficiency with web survey instruments, we received a regional diverse input. The north and the eastern sectors did not think this will work. Whereas the south, south east and the western sector believed seemed to think this would work well. Upon the launch of the survey, we got conflicting messages to the slow pace of survey uptake. We wanted to investigate to why things were going slow and realized, except Bangalore in most of the regions of India people were not as comfortable with web surveys as we had previously imagined. We then had to print the survey out, go personally, record the data onto hard copy and then convert it to a soft copy. This was time taking. This delayed us by two months.

From the experience, three issues might be considered for conducting a web survey in India;

First, A direct anonymous web survey may not work because of two reasons, In India trust is build through social interaction, the more frequent it is the better the chances of accessing people who will then give you credible data. Second, time is of the essence, but individuals are willing to engage seriously if they believe they will learn in the process. Thus a survey should not be just that, it should plan to give back immediately what the person engaging in the survey gives.

Second, we expected the persons to ask questions about the survey, we had planned for such a outcome. The capacity we had created in survey support groups was to clarify, encourage and motivate the survey participants to engage with the survey. What we had not accounted for was the innate desire from most of our partners to engage in a debate regarding the questioner. In a web-based questioner long distance discussion can become time consuming; this was indeed a challenge which I had not foreseen as the leader of the mapping exercise. The need to engage in a dialogue could be explained from two perspectives, first, it could be conjectures that the lack of trust between the researcher and the survey respondent is at its lowest, while the researcher has a lot of stake in the survey, wanting to get credible data, the respondents see it as a nuisance and indicates low commitment to its filling out.

In essence to get them to fill out the survey we needed to clarify and enable understanding in a more consistent manner than we had earlier envisaged. Second, we were unable to monitor when the survey was completed, some filled it out during a journey others at night from home and still others in many stages. All of these indicate that despite our concerted efforts using electronic media to convince people may not have worked as well as we had expected, however after a face to face meeting, and the buying in of the respondents, improves the quality. This we quickly understood and aloud our team members to improvise for better result. Our team leaders then

printed the material, made an appointment before hand, met them talked to them about the survey informally, got them to agree personally than come back to conduct the survey manually.

Third, I believe a web survey is viable in India only if we are able to get a management buy in, at first it took time for us to achieve this task but once the managements had understood the objectives and purpose of this survey we started getting a much better set of responses.

In summary; A large scale, national web survey in India should not be considered as a viable research tool, for the reasons stated above. The nature of belief systems, the attitude of knowledge as being predicated on human interaction, implying dialogue specific data gathering to be a better approach, although time consuming. It appears we had made a number of assumptions about conducting surveys in India, most of these assumptions while valid appeared valid for India too but the outcome did not reflect the validity of the assumptions for the reasons stated above. However I do not imply that firm level small scale survey is not viable, of course it is.

## **5 The presentation of the data using the Innovative potential and collaborative capacity Framework**

In this section we will focus on the key ideas that are interesting for our stated goal of elucidating ICT Innovation in India. In focusing on a few key ideas we will limit inductively develop some conjectures. These conjectures are discussion point informed by the data. Note, we are unable to definitively case one way or the other because we believe the process of data collection, modular in iits approach was not designed to be all encompassing, but comprehensive in itself. This meant we were comprehensive in treating the data we received but are unsure of the nature of the data entering the system at the first and second modules. Consequently instead of completeness we opt for interesting stories and aim to profile ICT innovation in India.

### **5.1 Limitations of the data set**

From the adopted methodology we have adopted and the resulting output puts on our interpretation some limitations, first, we are unable to clearly determine which companies are innovative and which are not in India. Our endeavor was not to create a profile of ICT innovative companies but to understand ICT innovation in India. This is because our sampling method provide a sample of companies that have been identified as being innovative in the public media or have been registered as innovative in the minds of our expert group across the regions in India.

Second, By sampling for innovative companies we cannot definitively indicate to what extent we have been successful, because we do not know if we have all the innovative companies in India for benchmarking purposes. This means we are unable to credibly determine the external reference by which to ascertain the representativeness of our sample within the population of Indian ICT innovative companies.

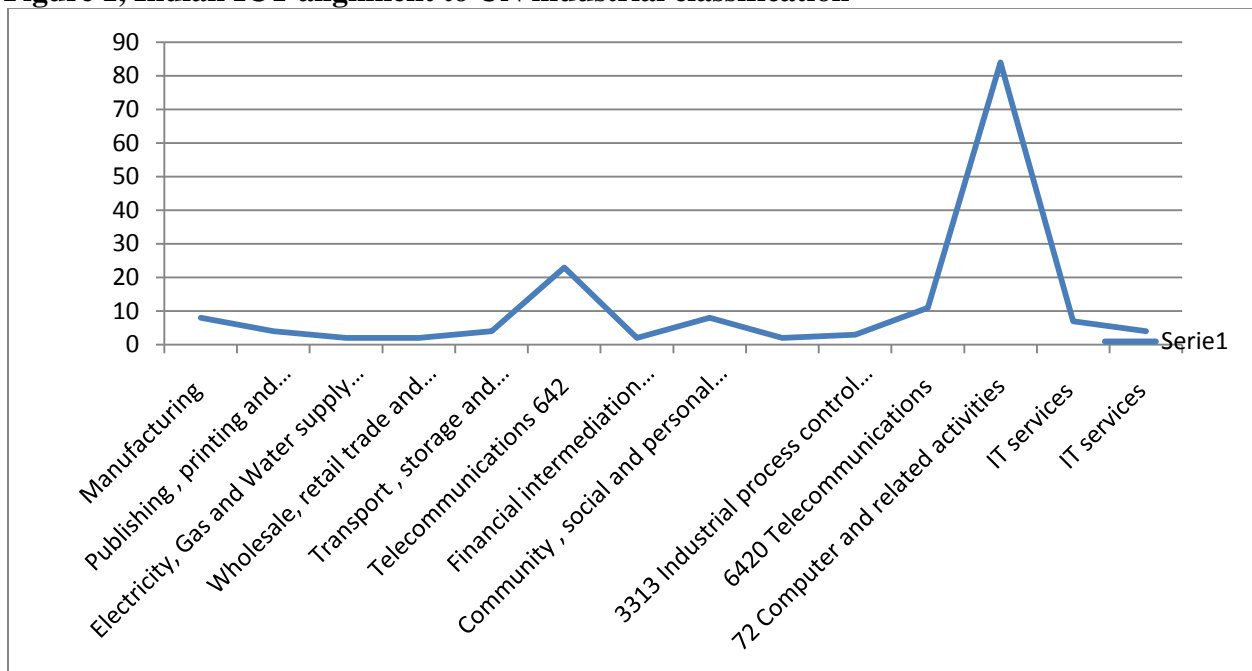
Third, we cannot benchmark our size profile against any other Indian profile in this regard but towards a general expectation of a distribution with some variance.

Fourth, what we can say is that we have a sample of innovative companies that seems to capture a cross section of Indian companies in a way that is credible though we cannot say to which degree we represent innovative companies in India.

### 5.3 Some background data on companies

Before we launch ourselves into providing an emerging indicator of the Indian ICT innovative landscape we feel it necessary to expose you to the some of the background data that creates the context of this study, for instance from figure, 1, we reveal the alignment of the ICT industry in India to the UN international statistics on industrial classification. From the figure below it is not difficult to see how the Indian ICT is aligned based on the answers received from the survey, the interesting item to note is that telecommunication (642), computer services (72) and telecommunication (6420) account for most of the ICT activity, a note of clarification the code 642 encompasses financial and social technology where as the code 6420 describes computer hardware and software services. We believe that the companies in the sample come from that many industries because of it significance to these industries. Since the IT-industry supplies ICT innovative solutions to all other industries the 20 non-represented industries may of course also use innovative ICT solutions but they have then been developed in other industries, though not necessarily exclusively in the ICT-industries of telecommunications (60-64), hardware (28-35) and software (70-74).

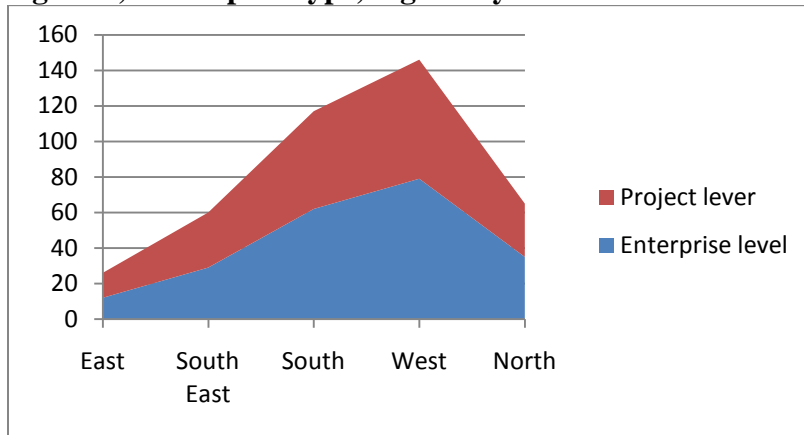
**Figure 1, Indian ICT alignment to UN industrial classification**



Source; Euro-India ICT Survey

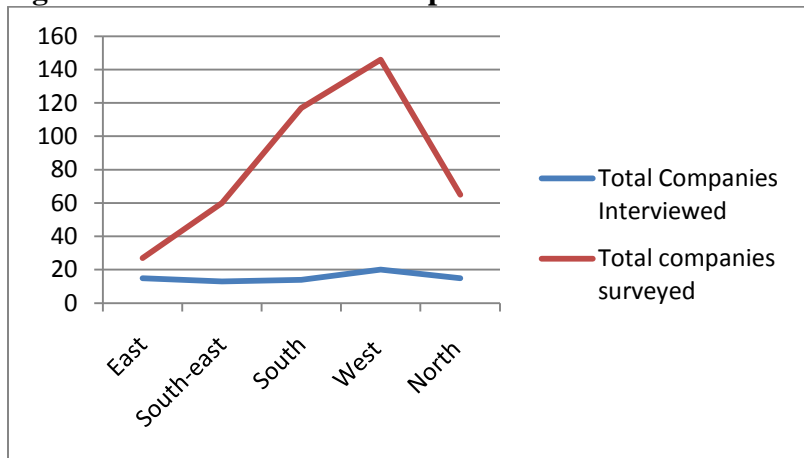
The next two figures (figure 2 and 3) shows the number of companies surveyed and regionally distributed, followed by figure 3 which shows the relationship between the surveyed companies and the interviewed companies. In this figure it is particularly important to note that we have interviewed a fraction of the companies we have surveyed. This is because of two reasons, methodologically it is imposible to interview all the companies therefore we identified companies to be interviewed based on a conceptual model CAMP-I, which we will explain further in a subsequent chapter (Chapter 3).

**Figure 2, Participant type, regionally distributed**



Source; Euro-India ICT survey,

**Figure 3 Total numbers of companies interviewed and surveyed**

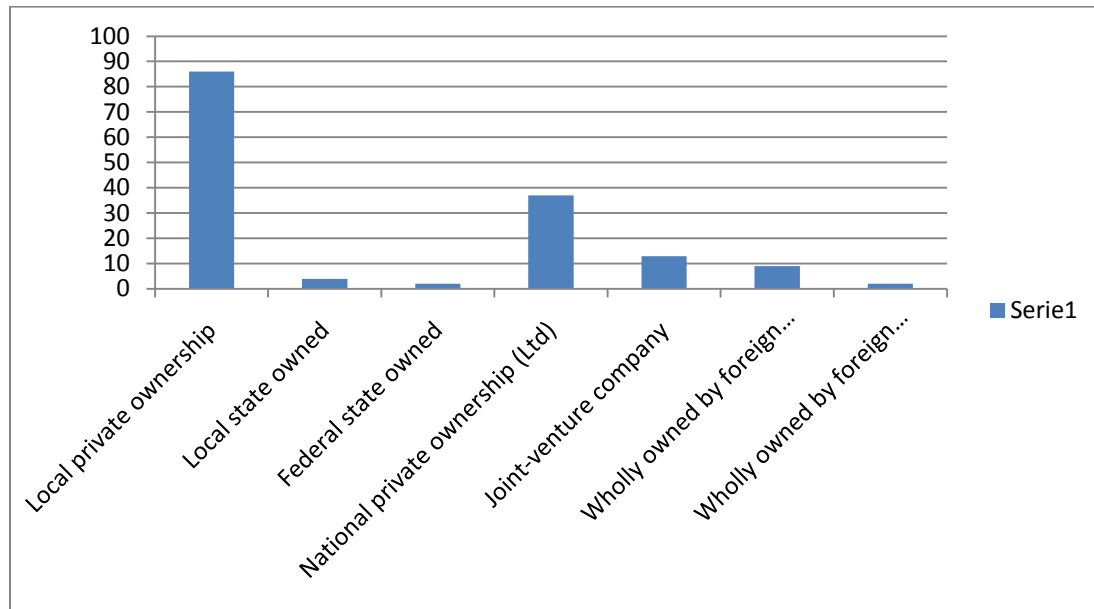


Source; Euro-India ICT survey,

In figure 4, we demonstrate the origin of ownership of Indian companies.



**Figure 4, Patterns of ownership of Indian ICT companies**



Source; Euro-India ICT survey

The pattern of ownership of Indian ICT companies falls into an expected pattern; however what is interesting is the pervasive growth of localized innovative ICT companies as opposed to nationally owned private companies. There is a difference in these two, while the locally owned is typically small or a medium firm with a regional spread; having offices within one or two region the national private owned subsidiary has a national footprint. There is another set of important indicator to note. Which is our expectation that more foreign owned subsidiary will show up in the data does not seem to have materialized. This could be because of two reasons. First, the foreign fully owned subsidiaries might not have seen themselves as belonging to the Indian Innovative landscape, even though they indirectly or directly have an impact on the Innovativeness of Indian ICT companies. Second, that these companies engage in innovation under the name of the parent firm, and since the parent firm is a foreign owned entity the innovation gets recorded abroad and not in India.

What we did not expect is the number of Joint ventures to be relatively prominent in the ICT sector. From the recent experience of joint ventures in the knowledge industry we expected this kind of business alliance to be limited. Clearly this is not the case according to the data, this implies that in some sectors of the Indian ICT business a joint venture like partnership is a worthwhile mechanism for creating a collaborative environment. This is an interesting finding because the conventional wisdom appears to indicate the joint ventures are generally a failure in the ICT sector.

Three points worth considering for ICT innovation on the basis of ownership patterns in India. First, since a large number of ICT firms are privately owned regionally located, we might conjecture that these firms are small and medium scale. Second, we might be able to indicate that ICT innovation has a larger footprint in these localized private ICT firms and third that small and

medium private firms are better geared to ICT innovation. Yet, we cannot state for each innovation how “big” it was in terms of its contribution to turnover or to market share.

Next we evaluate the size of Indian ICT firms and discuss what we can understand from a standpoint of innovation. The researched wisdom is split on the role size plays in innovation in general. The origin of the debate on size of the firm and its ability to take part in innovation emerges from the Schumpeterian hypothesis on productivity and scale economics. The Schumpeterian hypothesis predicts a positive relationship between innovation and monopoly power. The second hypothesis states that large firms will be more than proportionately innovative than small firms Schumpeter (1942). As in the larger the firm the more resources it can bring to bear on R&D, (Stock et al. 2002). Consequently, larger size will allow a firm to accumulate a larger store of technological knowledge and capabilities (Damanpour, 1992) and (Caputo et al. 2002) show a positive correlation rate among enterprise size and innovation ability.

However in their literature review, Kamien and Schwartz (1975, p. 15) characterize the objective of this stream of research in the following manner: “A statistical relationship between firm size and innovative activity is most frequently sought with exploration of the impact of firm size on both the amount of innovation effort and innovation success.” Kamien and Schwartz (1982, p. 84) find that “beyond some magnitude, size does not appear to be especially conducive to either innovation effort or output.” Another consideration is that engineers and scientists in a smaller firm may be more highly motivated than in a large firm. In a small firm, the compensation of an individual may be more tightly linked to performance than in a large firm, particularly in those entrepreneurial firms where a scientist or engineer receives stock or stock options as part of a compensation package. Kamien and Schwartz, 1982). Smaller firms showed a significantly higher rate of change in product performance, on average, than did larger firms. Our results therefore provide evidence for the argument that smaller firms are more technologically innovative, at least in a dynamic sense of quick response to new opportunities and fast taking them to the market, i.e. a short lead time (Stock et al. 2002).

The three tables, 1 which tells us about the number of employees, table 2 which informs us on the amount of annual revenues and table 3 which indicates exports we need to take together to develop a inductive interpretation of what is going on. On some reflection two conjectures can be discussed.

First that small and medium firm seems to populate our data set, in effect there are many more smaller and medium firms surveyed than the large ones, second that the small and medium ICT firms tend to be privately owned and regionally distributed if we combine our insight from figure 3 and 4. What does that tell us about the Indian ICT innovative landscape? Rather little at this stage. All we can say is that we have a bias in our sample, meaning our sample of firms represents small and medium scale company’s more than large companies.

Combining table 1, which shows us the number of employees in a firm, with table 2, which gives us an indication of total value of sales combining it with the total value of sales helps us to develop an emerging picture of Indian ICT firms, here a note of caution, we are employing inductive arguments, this implies we use to data to develop some conjectures. Here we are

arguing that in combination the three tables indicate that in the sample of ICT innovative companies we find relatively more small firms than we would have expected from the literature advantaging middle size and larger companies. To the degree that entrepreneurship (also in Schumpeterian sense) is more likely to imply innovation in the field of ICT we may consider the reason to be that barriers to entry in terms of a minimum efficient scale of capital is significantly lowered over the years as hardware and networks have become less and less expensive to acquire. Access to software tools licensed on open source or/and free software terms also reduces the entry barriers significantly.

**Table 1. Employee spread from 2006 to 2008**

Full time employees	2006	2007	2008	Size distribution in the sample in 2008
1- 250	79	74	77	54
251 - 500	29	29	28	20
501 - 2000	12	16	17	12
2001 - 10.000	10	10	10	7
10.001+	9	10	10	7
Total	139	139	142	100

Source; Euro-India ICT survey

**Table 2. Value in terms of sales in Indian ICT firms, from 2006 to 2008**

Value of sales	2006	2007	2008
- 50 lakhs	25	18	21
51 lakhs - 1 crore	15	14	6
1- 50 crore	54	50	54
51- 100 crore	11	19	22
100+ crore	25	29	30
Total responses	130	130	133

Source; Euro-India ICT survey (1 lakh =  $10^5$ ; 1 crore=100 lakhs)

**Table 3. Export Value from 2006 to 2007 of Indian ICT firms**

Value of export	2006	2007	2008
- 50 lakhs	42	40	39
51 lakhs - 1 crore	11	6	10
1- 50 crore	39	44	41
51- 100 crore	3	6	7
100+ crore	15	16	17
Total responses	110	112	114

Source; Euro-India ICT survey

We may take into consideration the findings on Indian industry structure reflected in this quotation:

“In South Asia, the extreme peculiarity of the Indian structure is immediately apparent. India has an exceptionally large proportion of employment in the lowest size-group of 6–9 workers and an exceptionally low relative value added per worker in this group. Furthermore, the size distribution is characterized by a large presence of the 500+ group of firms with a conspicuous 'missing middle'. This pattern resembles that of Japan in terms of a 'dualistic' development, but is wildly exaggerated in the Indian case.” Chapter 9. Dipak Mazumdar and Sandip Sarkar (2008) GLOBALIZATION, LABOR MARKETS AND INEQUALITY IN INDIA, Routledge/IDRC. e-ISBN 978-1-55250-373-7.

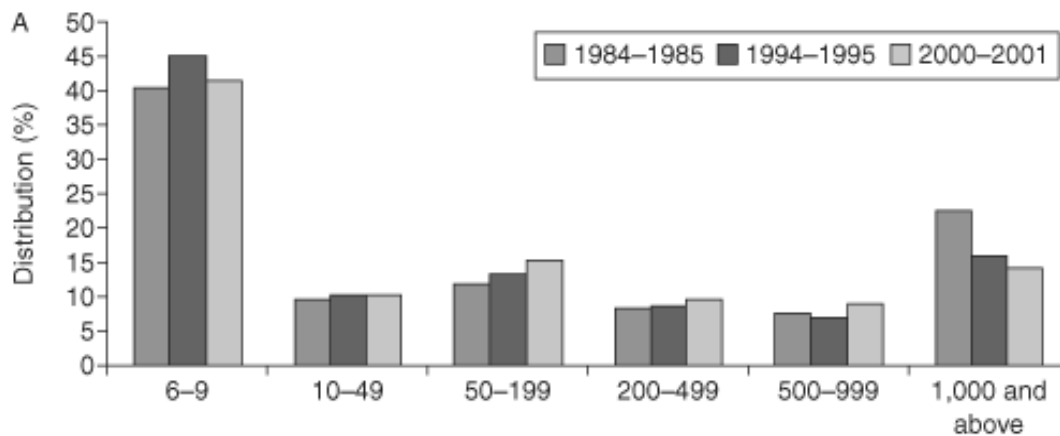


Figure 9.2 India–Panel A: Distribution of employment (in %) in manufacturing firms by employment size groups.

In the sample we have 74% of the companies in the size group below 500 and of these we have more than half in the -250 group. We have no record of the frequency of companies in the

extreme small size of 6-9 workers but we have had cases of this size of company in some of our interview cases. Further, the categories of revenues reveal that we have 40% of the sample in a middle category, viz. the group 1- 50 crore (10 mill. - 500 mill. rupees) and 35% of the sample in the lowest category of revenues, – 50 lakhs (- 5 mill. rupees), which would likely include the very small companies. Contrary to the general finding referred above, we have a high frequency of medium sized companies in the innovation sample. This indicates that ICT innovative companies sample may not follow the manufacturing picture of company size distribution in India, though we do see a growth in relative number of companies in the size group of 50-199 employees over almost three decades (or in their size within this group).

In summery; four key features from the background data emerge, first, it might appear that we have a sample bias of largely small firms, yet it is coming to no surprise considering the general distribution of companies in the Indian society, yet may come as a surprise because we have focused on innovative companies only.

Secondly, the most innovative firms are generally expected to be not the very small ones but those in the middle range of 250-2000 employees and that does seem to apply to India, too. Exactly in this size category we may have a higher “representation” in our sample compared to the general picture of Indian size distribution of companies as remarked in the citations above.

Third, the interviews we conducted with a smaller sample based on the results of the survey. The selection of the companies to be interviewed was based on criteria’s developed using the CAMP-I model (to be discussed at length in the next chapter), and fourth that the ownership pattern of firms is curiously in favour of wholly owned localized privately owned firm.