Organisational Practices for Innovation in Indian Industries

A firm level case study on Human Resources and Work Culture

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Pradosh Nath (PI)

Raghabendra Chattopadhaya (Co PI)

Centre for Knowledge, Ideas and Development Studies,

Delhi

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Introduction

The DST report based on National Innovation Survey (NIS) has brought out a few important and interesting insights. The three legs of National Innovation System are Production system (firms as agent), Technology generation System, and the govt. system as an enabling agent. Among other things, National Innovation Survey shows the disconnect between production system and innovation support system (the enabling initiatives of govt.) The finding necessitates closer look inside innovative firms and the agencies in the support system to understand the 'disconnect'. The proposed study makes an effort to examine the internal system of innovation of a firm.

Within the NIS approach to innovation reasonably large body of literature has been published on National and sectoral systems of innovation. The NIS, however, does not offer a micro theory of innovation. Or, in other words, there is a need to understand the innovation dynamics inside the firm.

In the present study we try to probe Firm level Innovation System; or Innovation System Internal to Firm. For a workable perspective of the study let us restate the generally accepted definition of innovation - as application of (advance) scientific and technological knowledge in the production system. At country level innovation is marked as the key factor for economic growth (Schumpeter 1934; Solow 1956), whereas at the firm level innovation has been seen as the key to increase in firm level productivity. What are the determinants of innovation ability?

Literature Review

Becker in his seminal work 'Human Capital' argues that increasing reliance of industries on scientific and technological knowledge greatly enhances the value of education, technical schooling, on-the-job training, and other human capital. At the same time Becker writes, 'New technological advances clearly are of little value to

countries that have very few skilled workers who know how to use them.' Becker credited Adam Smith for enormous insights of division of labour and productivity gains. Marshal summarised the importance of human capital as, "The most valuable of all capital is that invested in human beings." (Alfred Marshal, Principles of Economics).

'Human Capital' can briefly defined as kind of knowledge and skill that cannot be separated from people who own it. We can also add health and values to many other attributes that are human embodied. Therefore, Economists regard expenditures on education, training, medical care, and so on as investments in human capital (Becker). It is human capital that makes innovation happen.

There are a few empirical studies validating human capital, among others, as an important determinant of innovation at the country level (e.g. Dakhli & De Clercq, 2004). Does human capital play similar pivotal role at firm level? Most firm level studies had focused on R&D activities, technology access, age, and firm size as determinants of innovations (Hirsch-Kreinsen et al., 2005; Shefer & Frenkel, 2005). While human capital as determinant for firm level innovation has been largely ignored, a few available studies focus mainly on firms in developed countries (Schneider et al. 2010; Vinding 2006; Teixeira & Tavares-Lehmann 2014; Leiponen 2005; Beugelsdijk 2008, also (e.g. Laursen & Foss, 2003; Santamaría, et al., 2009, for Denmark and Spain respectively)). And all these studies found a positive relation between innovation and level of education of the employees and training provided/arranged by firms. A few studies on developing countries arrived at similar findings (Knight et al. 2003 on Ethiopia, Bradley et al. 2012 on Nairobi, Kenya). However, studies on Ghana (Goedhuys, 2007), and Tanzania (Robson et al., 2009) did not find any relation between training and innovation.

It is interesting to note that studies on developing countries, instead of contextualising the problematic, focused only on the hypotheses received from the experiences of the developed economies. In the context of the present study we shall like to postulate that from Adam Smith to Gary Becker, human capital has indisputably evolved as the key

factor for economic growth of a nation. There is no reason to believe that it is not so at micro level production system involving firms. The issue, therefore, is not how far the relationship is valid in the context of different economies, but to probe the firm level practices for creating firm specific human capital, and assess the implication of the same on technology and innovation orientation of firms.

Becker and Murphy (1992:1156) have restated Adam Smith's insight on 'Division of Labour' as follows. 'Workers concentrate on different tasks and combine their activities in "teams" to produce each sector's output. A more extensive division of labor raises productivity because returns to the time spent on tasks are usually greater to workers who concentrate on a narrower range of skills.' They observed, 'Adam Smith's emphasis on the importance of specialization and the division of labor to economic progress is not simply an influential landmark in the development of economics. An analysis of the forces determining the division of labor provides crucial insights not only into the growth of nations, but also into the organization of product and labor markets, industries, and firms.' However, they went further to argue, 'We believe that the priority Smith gives to the division of labor among workers is an enormous insight. But we differ with his claim, followed by many later economists, that the degree of specialization is limited mainly by the extent of the market. Specialization and the division of labor are also influenced by several other factors that often are far more significant than the extent of the market.' Elaborating further, they suggest that application of new knowledge tend to raise the optimal division of labour through increased specialization balanced by the cost of combining specialized workers (cost of coordination). 'Increased specialization in turn raises the benefits from investments in knowledge, so that the growth in tandem of specialization and investments in knowledge may allow an economy to continue to develop.'

As Becker would argue, having an endowment of human capital does not ensure higher productivity. In the context of innovation we restate it as - having an endowment of human capital does not automatically lead to application of the embodied knowledge. There has to be carefully designed teams based on specialization, there has to be proper coordination for synergy among the teams.

Human capital has to be adequately activated through incentives towards motivation of the employees. These are the best practices for organizing, nurturing and activating human capital in the production system based on application of new knowledge; the path of innovation.

The present study is designed broadly following the above understanding. The contribution of the study therefore are four folds: It is more comprehensive, it reorients the study on firm level innovation from verification of determinants to activation of the determinants, and in that it brings in to focus three aspects: How the employees are organized, how are they motivated to give their best – incentivisation, and how the alienation is allayed through employees' participation in decision making. We develop a few proxies to capture the firm level practices accessing knowledge, skill development, incentives and motivation, and coordination.

The study and the methodology

The proposed study makes an effort to examine the internal system of innovation of a firm. One of the major lacunae of the NIS approach to innovation is that it still does not have a micro theory of innovation. We look at Firm level Innovation System, or Innovation System Internal to Firm, which essentially means to look at the innovation ability of a firm as the talent pull available to the firm. Or, in other words Human resource and work culture of a firm. We broadly ask two questions:

1. What do innovative firms do for creating enterprise specific human capital?

2.What are the characteristic differences (if any) among firms that can explain behaviour of firms, if those are distinctively different?

The questions were approached by examining the human capital related practices of the innovative firms. Innovative firms have been selected from the DST report on National Innovation Survey, 2013. DST Survey covered 36 states and Union Territories. DST Survey has ranked the states in terms of their innovation potentiality. We have chosen firms from seven states; two top innovation potentiality states (Karnataka and Maharashtra), two from middle level innovation potentiality (West

Bengal and Delhi), and two from the bottom (Tripura and Bihar). We have chosen Gujarat as a special case, because, although the state is highly industrialised, it is not high in innovation potentiality ranking.

Again, firms were chosen from top three sectors (NIC) in terms of innovation potentiality in the selected states identified in the DST study.

State-wise sectors chosen are:

Karnataka – Basic Metal (NIC 24); Fabricated Metal Products (NIC25) and Machinery & Equip (NIC 28)

Maharashtra – Basic Metal (NIC 24); Fabricated Metal Products (NIC25) and Machinery & Equip (NIC 28)

West Bengal - Leather and products (NIC15); Fabricated Metal Products (NIC 25) and Machinery & Equip (NIC 28)

Delhi Food products (NIC10); Wearing apparel (NIC 14); and Electric Equipment (NIC 27)

Bihar – Food products (NIC10); Chemical and Chemical Products (NIC20) and non-metallic mineral products (NIC23)

Tripura – Food products (NIC10); Rubber and Plastic Products (NIC 22) and non-metallic mineral products (NIC 23)

Gujarat – Textiles (NIC 13); Fabricated Metal (NIC 25) and Machinery & Equip (NIC 28)

We proposed to choose 105 innovative firms (15 in each states, and 5 firms in each sector). However, in most of the sectors there were not many innovative firms to choose from. We, therefore, decided to cover all innovative firms in the sectors chosen in a state. Thus we covered 129 firms; 20 each from Maharashtra, Karnataka, West Bengal, Delhi, and Tripura, 15 in Bihar, and 14 in Gujarat.

Table 1: NIC categories of firms studied in 7 different states

	NIC 10	NIC 14	NIC 15	NIC 17	NIC 23	NIC 24	NIC 25	NIC 27	NIC 28	Total
Delhi	6	5	3	1			1	3	1	20
West Bengal			10				5	2	3	20
Karnataka						5	5		10	20
Maharashtra						2	7	2	9	20
Tripura	6				11		3			20
Bihar	1			1	13					15
Gujarat		2					2		10	14

Table 2: Types of innovations by the firms studied in 7 different states

	Product	Process	Quality & Standard	Input	Alter material	New Machine	Market	Organization
Delhi	11	13	13	8	6	15	12	4
West Bengal	12	11	18	7	8	19	9	1
Karnataka	5	8	4	1		16	6	2
Maharashtra	4	7	3	2		9	12	1
Tripura	2	12	7	1	0	15	1	1
Bihar	1	1	10	1	0	1	4	1
Gujarat	3	9	5		1	7	9	

Information and Data analysis

Firms in the study

Five attributes have been used: Types of Innovation (TOI), Size in terms of Turn Over (TO), Size in terms of Manpower (MP), Market reach of the firms (MktR), and Competition Intensity (CI) faced by a firm.

- About 65% firms claim innovation in 'New Machine' type, followed by 'Process' innovation (48%) and 'Quality and Standard (45%).
- Size of the firms (TO) shows that about 43% firms have less than Rs. 1 cr as TO, and 73% fall under less than Rs. 10 cr category.
- When classified by MP, about 68% firms have less than 60 Manpower, but about 20% firms have more than 100 manpower.
- Market reach (MktR) of the firms with only local reach (36%) and firms with national market reach (38%) have more or less same presence in the study. 19% firm has claimed having reach in the international market.
- About 53% firms operate in a market with 20 to 60 competitors; and about 29% firms have competition with more than 100 firms. We, therefore, are dealing with firms not having any substantial market domination.

Firms in the study have been classified in 5 different ways; types of innovation (TOI), Annual Turnover (TO), Manpower (MP), Market reach (MktR), and intensity of competition (CI). Inclusion of the last two attributes is the methodological novelty claimed by the study.

Studies on Innovation and HR examine the firm level behaviour mainly in terms of size and age of the firms. Size of the firm as a popular attribute has been the result of a inverted understanding of Schumpeterian theory of technological innovations, which suggests that realisation of cost of innovation requires larger market share. In empirical studies the size of the firm (TO) has been taken as the proxy for firm's ability to realise the cost of innovation. And the argument was further extended to suggest that larger firms are likely to be more innovative. What have been ignored in the process is the associated conditions that innovation by a firm is also influenced by the market condition with in which a firm operates. More than the absolute size of a firm, market reach (MktR) of the firm and competitive intensity (CI) within which firm operates would be appropriate attributes for examining firm level behaviour. The present study makes an effort to develop indicators to capture both the market reach and competition intensity of the firm. And as we see both the attributes explain more than the other traditional attributes.

Table 3 shows 64% firms claiming innovation in terms of introducing new machines. This is followed by process innovation. Marketing innovation also has significance presence (41%). It is to be noted that organisational innovation does not have much presence. It is generally understood that technological innovation necessitates push in marketing and changes in the organisational practices. Low incidence of organisational innovation suggests that we should not expect much variation in organisational practices of the firms.

Table 3: Innovation types of the firms

Type of Innovation	No. of firms	%
Product	34	26.36
Process	62	48.06
Quality and standard	59	45.74
Input use	20	15.50
Alternative material	15	11.63
New Machine	83	64.34
Marketing	53	41.09
Organization	10	7.75

Table 4 Shows firms classified in terms of their Annual Turnover (TO). We would like to examine if HR related practices have distinctive differences among firms of different sizes. About 43% firms fall in the less than Rs. one crore annual turnover. About 73% firms fall under less than Rs. 10 crore turnover category. The study, therefore, has overwhelming presence of small firms.

Table 4: Firms classified in terms of Turnover

TO in crores	No. of firms	%
Less than1	55	42.64
1 to less 5	17	13.18
5 to less 10	22	17.05
10 to less 20	16	12.40
20 to less 50	6	4.65
50 to less 100	9	6.98
100 & above	4	3.10
Total	129	100.00

Since information on annual turnover of firms is not always fully dependable, we also take manpower (MP) strength of a firm as another indicator of the size of the firm.

Table 5 shows the size of firms classified in terms of manpower. Table 4 shows that about 68% firms have less than 60 manpower, but about 20% firms have more than 100 manpower.

Table 5: Size of the firms in terms of manpower (MP)

MP	No. of firms	%
<10	8	6.30
10 to < 20	27	21.26
20 to < 40	35	27.56
40 to <60	16	12.60
60 to <80	10	7.87
80 to < 100	6	4.72
100 to < 200	17	13.39
200 and above	8	6.30
Total	127	100.00

Note: Two firms did not provide the Manpower data

We also wanted to examine if firms practices differ over their market reach. We have taken four broad categories; namely, only local market, market covering more than three states, national market, and firms having market with international reach as shown in table 6. It is to be noted that firms with only local reach (36%) and firms with national market reach (38%) have more or less same presence in the study. 19% firm has claimed having reach in the international market.

Table 6: Market reach of the firms

Market Reach	No of firms	%
Local	46	35.66
More than 3 states	9	6.98
National	49	37.98
International	25	19.38
Total	129	100.00

One important aspect we wanted to examine is the intensity of competition faced by the firms and its implication on work culture and organizational practices. The effort was not very successful in the sense that firms could not provide information on how they assess competition in the market in terms of technology related advantages and disadvantages. The useable information that could be gathered was the number of competitors. faced by a firm. More number of competitors. would mean that firms do not enjoy much scope of creating price advantage; and hence innovations having implications on prices higher than the ruling market price would be rare. Table 7 shows % of firms with different competition intensities. About 53% firms operate in a market with 20 to 60 competitors.; and about 29% firms have competition with more than 100 firms. We, therefore, are dealing with firms not having any substantial market domination.

Table 7: Competition Intensity faced by the firms

CI	No of firm	% of firms
<10	5	3.88
10 to <20	19	14.73
20 to < 40	37	28.68
40 to < 60	31	24.03
60 to< 100	17	13.18
100 & above	20	15.50
Total	129	100.00

As we have mentioned above, we attempt answers. to two questions:

1. What do innovative firms do for creating enterprise specific human capital?

2. What are the characteristic differences (if any) among firms that can explain behaviour of firms, if those are distinctively different? We present the broad practices of the firms in this regard as answers to the first question. We then examine the same issues with respect to firm specific firm level characteristics.

What do innovative firms do for creating enterprise specific Human Resources/capital?

The question is approached with following three subsidiary questions:

A. How is the Human resource endowment of the firms is organised
B. How is it nurtured
C. How is it used for gains from innovation

A. How Human resources/capital is organized in the innovative firms

How HR is organized

Summary observation

Issues examined are: HR endowment, Departmentalisation, Technical Manpower and deployment, and Mobility of Manpower.

90% firms do not have any innovation department, 85% do not have any R&D division. In case of 43% firms more than 60% workforce is deployed in the shop floor.
This is indicative of the fact that maintaining production capacity is the main function and concern of the firms; typical of firms operating in a competitive market condition, where firms survive by adopting practices that are in vogue in the market. This is consistent with the findings from NIS, which shows 'New Machines' as major mode of innovation coupled with innovations that are new to firm.

There is indication that firms involved in product and process innovation are more inclined to employ skilled manpower. Also demand for skill increases with higher size, and wider market reach of the firms. It is also indicative of the fact that adequate impetus to growth and availability of skilled manpower coupled with wider market reach can make SMEs more innovation oriented.

Mobility of manpower in terms of numbers added and number of attrition does not show much movement of technical manpower. It is even less in the case of non-technical manpower. A few studies that are available on Human Resource issues in Indian SMEs also indicate the lack of mobility of manpower. In effect it indicates the lack of technology related activities in Indian industries. As we shall see that the same is reflected in technology initiatives of the firms, and also in skill development through training of manpower.

Human resource endowment and deployment of HR

We look at the human resource endowment of firms, technical and non-technical manpower, how they are deployed over departments, addition, and attrition (mobility) of manpower.

Table 8 shows the human resource endowment of the firms studied. We also use the endowment of human resources as a proxy for the firm size. About 31% firms are in the 20 to less than 50 workers. category. Delhi and Gujarat have one firm each in the more than 500 workers. group.

Table 8: Human resource endowment of the firms

States	No. of workers.											
	< 10	10 to < 20	20 to < 50	50 to < 100	100 to < 150	150 to < 200	200 to < 300	300 to < 400	400 to < 500	500 and above	NA	Total
West Bengal		5	6	3	3	2					1	20
Delhi	1	4	5	4	1	1	1	1		1	1	20
Tripura	2		4	9	4	1						20
Maharashtra	5	8	6	1								20
K'taka		4	12	2	1	1						20
Bihar		5	6	4								15
Gujarat		1	1	3	3	2	1	2		1		14
Total	8	27	40	26	12	7	2	3	0	2	2	129
% of total	6	21	31	20	9	5	2	2	0.0	2	2	100

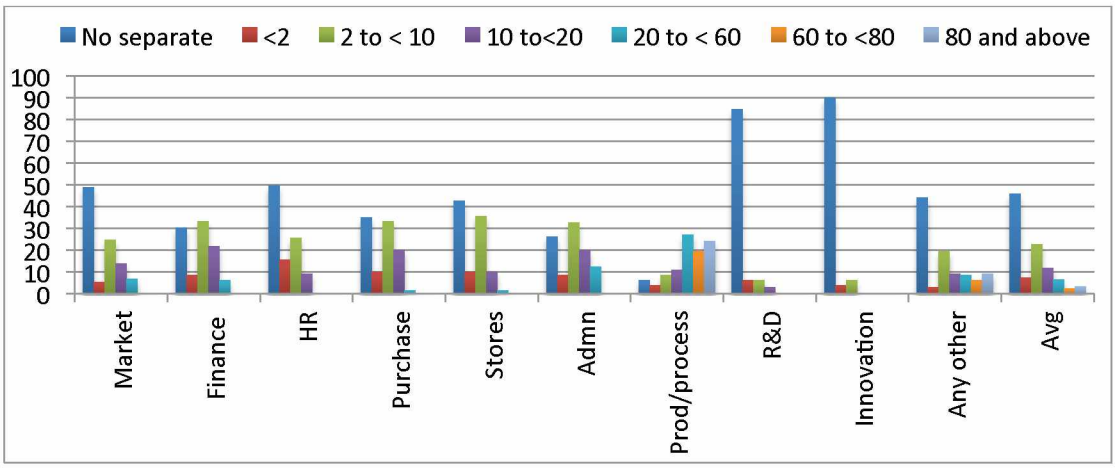
Table 9 shows the deployment of human resources over different departments. For the purpose of the study we have considered standard practice of departmentalization as a proxy of division of labour. This is different from Adam Smith's division, which essentially deals with shop floor. Contemporary understanding is 'production organisation', where division of labour in the shop floor is technically given to a firm. A firm as an organization divides its activities in different components, production (shop floor) being just one of those. Table 9 reveals the relative importance given to a particular activity by a firm. About 84% firms do not have any R&D division; and it is

90% in the case of innovation. 50% firms do not have any HR division. Accompanying figure 9 shows the graphical presentation of the relative importance of the departments. Production unit has 24% firms having more than 80% of the workforce; 43% having 60% or more share of the workforce. For easier reference graphical representations of the tables have been numbered following the number of the table. For example, graphical presentation of table 9 is numbered as Figure 9.

Table 9: Deployment of Human resources (% of firms)

% share	Market	Finance	HR	Purchase	Stores	Admn	Prod/ process	R&D	Innovation	Any other
No separate	48.84	30.23	49.61	34.88	42.64	26.36	6.20	84.50	89.92	44.19
<2	5.43	8.53	15.50	10.08	10.08	8.53	3.88	6.20	3.88	3.10
2 to <5	10.08	13.18	11.63	18.60	19.38	10.08	6.98	1.55	3.10	6.20
5 to<10	14.73	20.16	13.95	14.73	16.28	22.48	1.55	4.65	3.10	13.18
10 to<20	13.95	21.71	9.30	20.16	10.08	20.16	10.85	3.10	0.00	9.30
20 to <40	6.20	5.43	0.00	1.55	1.55	9.30	14.73	0.00	0.00	6.20
40 to <60	0.78	0.78	0.00	0.00	0.00	3.10	12.40	0.00	0.00	2.33
60 to <80	0.00	0.00	0.00	0.00	0.00	0.00	19.38	0.00	0.00	6.20
80 and above	0.00	0.00	0.00	0.00	0.00	0.00	24.03	0.00	0.00	9.30

Figure 9: Deployment of Human Resources



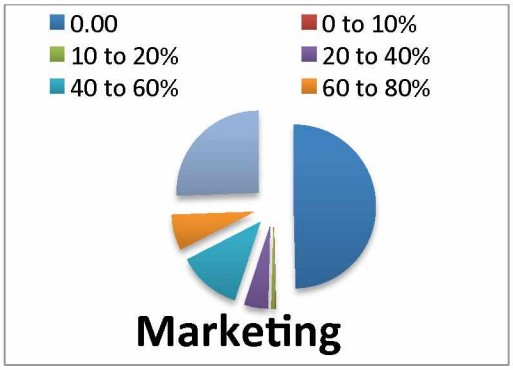
Departmentalisation and share of technical manpower

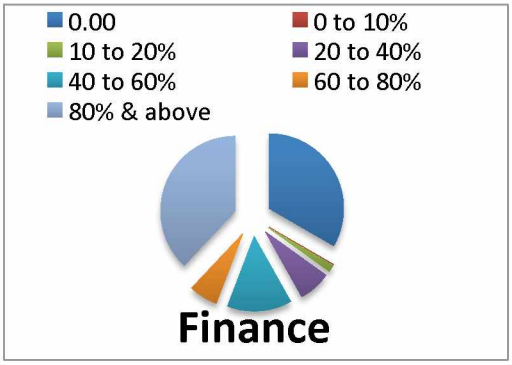
Table 10 presents share of technical manpower in different activities of the firms studied. Technical manpower includes employees holding technical degrees and diplomas. Experienced technical manpower without degree and diploma has not been included in the count for technical manpower. The data presented in the table refers to the firms having separate divisions from the listed ones. Thus, as we have seen from the table 9, 50% of the firms do not have HR as separate division. And among the rest, 50% do not have any technical manpower. It is to be noted from the table that even production division does not have technical manpower in about 35% of cases, and run by the experienced hands being in the company for a long time. As we shall see later, most of the firms arrange on job training of their employees within the company. The large percentage of firms showing no technical manpower in R&D and Innovation divisions is because most of the firms do not have such divisions (see table 9). Department wise graphical presentation is shown in figure 10.

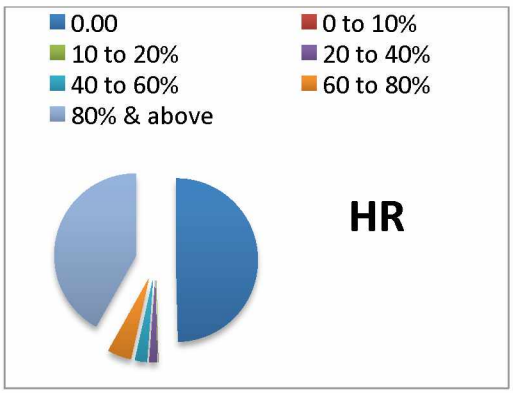
Table 10: Share of technical manpower

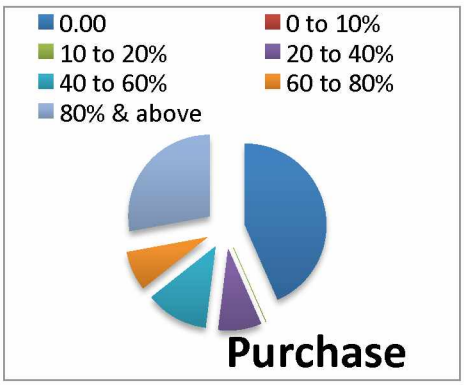
Division	No Tech	>0 to 10%	>10 to 20%	>20 to 40%	>40 to 60%	>60 to 80%	>80% & above
Marketing	49.61	0.00	0.78	4.65	12.40	6.98	25.58
Finance	33.33	0.00	1.55	6.98	13.95	6.20	37.98
HR	49.61	0.00	0.00	1.55	2.33	4.65	41.86
Purchase	43.41	0.00	0.00	8.53	12.40	7.75	27.91
Stores	65.12	0.78	0.78	2.33	8.53	3.88	18.60
Admn	61.24	0.00	3.10	11.63	9.30	2.33	12.40
Prod/process	34.88	13.18	10.85	13.95	6.98	0.78	19.38
R&D	85.27	0.00	0.00	1.55	0.78	2.33	10.08
Innovation	91.47	0.00	0.00	0.00	0.00	0.78	7.75
Any other	95.35	0.00	0.78	0.00	0.00	0.00	3.88

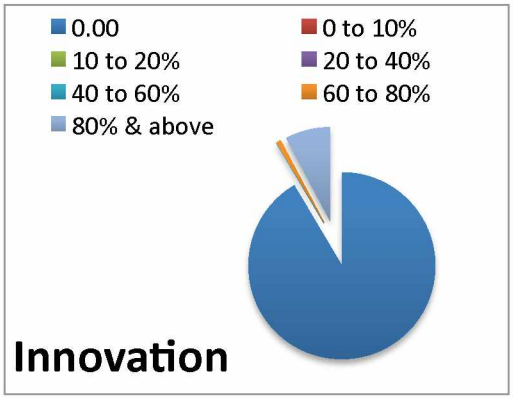
Figure 10: Share of technical manpower in departments

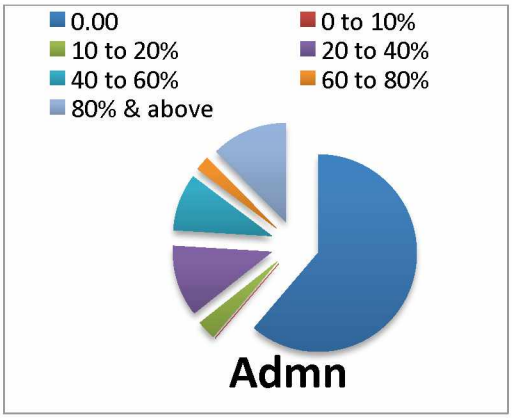


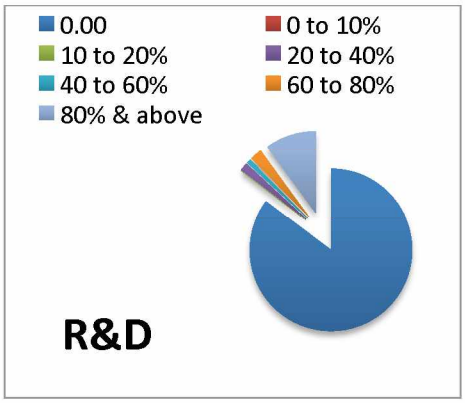


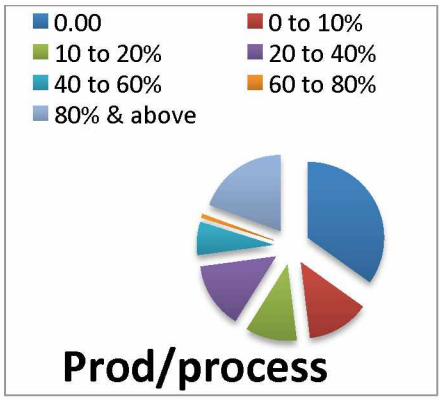


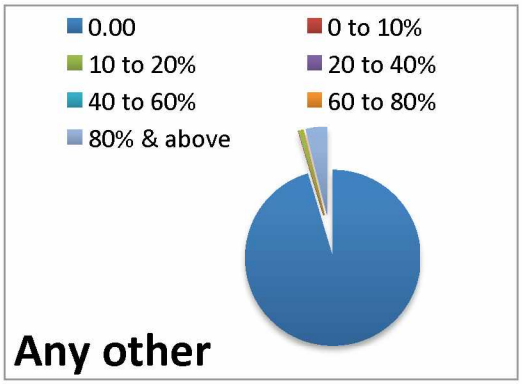


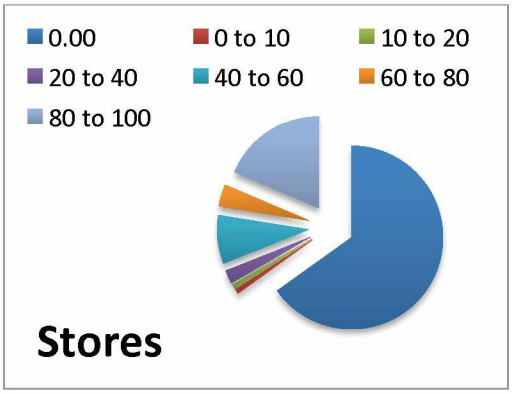












Tables 10.1 to 10.5 show share of technical manpower in terms of the five firm level attributes mentioned above. We have tried Analysis of variance (ANOVA) to examine if there is variation that can be explained in terms of the attributes. The ANOVA exercise didn't yield much meaningful result. For easier reading of the data graphical presentation is also maid accompanying all the attributes. In figure 10.1 lines are used to indicate variations over innovation types. Two black lines are used for 'Innovation' and 'R&D' for special emphasis. Highest share of technical manpower is in 'Finance', 'HR' and 'Purchase' departments. These are followed by 'Marketing', and then 'production' division. 'R&D' and 'Innovation' divisions, which are present in a very few cases, have lowest share of technical manpower. It is to be noted that there is over the 'innovation types' variations in the share of technical manpower, but variations follow the similar pattern across the departments for all types of innovations.

It is to be noted that although HR, Purchase, and Finance show higher shares of technical manpower, 50%, 35% and 33% firms respectively do not have any such

separate divisions. And out of the rest, 50%, 43% and 33% firms respectively do not have any technical manpower in HR, Purchase, and Finance divisions.

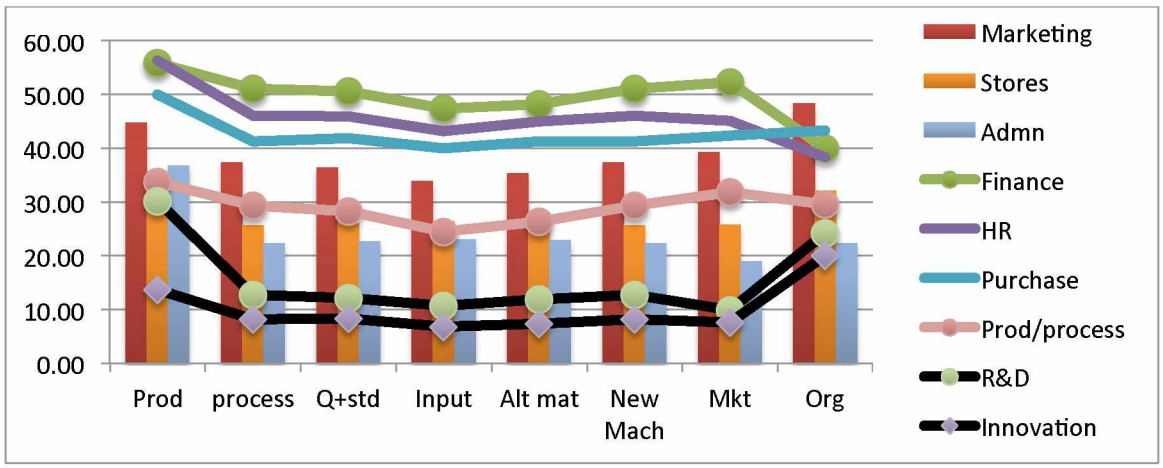
ANOVA accepts the null hypothesis that average technical manpower is the same for firms across innovation types (F=1.72, Pr (>F)=0.15). ANOVA for one innovation type vis-à-vis other types rejects null hypothesis only for firms engaged in product innovation, and Marketing innovations. This suggests that there is significant relation between firms doing product/market innovation and share of technical manpower. It is not so for other types of innovations.

Table 10.1: Share of technical manpower in terms of types of innovations

(Average of all firms)

	Overall	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/ process	R&D	Innovation	Any other
Prod	34.39	44.82	55.82	56.37	49.96	30.04	36.74	33.76	30.15	13.73	5.88
Process	27.38	37.38	51.11	46.03	41.26	25.67	22.33	29.33	12.70	8.27	3.21
Quality	27.20	36.39	50.60	45.97	41.90	26.07	22.68	28.22	12.11	8.40	3.26
Input	25.56	33.87	47.32	43.20	40.00	26.33	23.07	24.51	10.76	6.85	3.70
Alt mat	26.46	35.37	48.15	44.94	41.27	26.54	22.97	26.37	11.89	7.44	3.42
New Mach	27.38	37.38	51.11	46.03	41.26	25.67	22.33	29.33	12.70	8.27	3.21
Marketing	27.43	39.27	52.26	45.11	42.30	25.85	18.99	31.88	9.93	7.61	1.09
Org	29.82	48.33	39.94	38.33	43.33	32.14	22.33	29.64	24.19	20.00	0.00

Figure 10.1: Share of technical manpower in terms of types of innovations



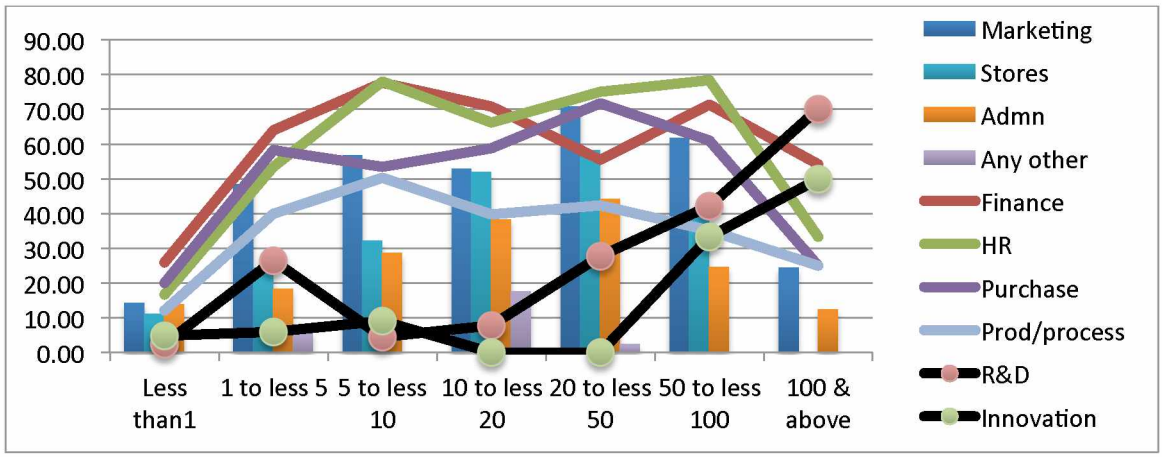
In terms of TO, the pattern of inter departmental share of technical manpower remain the same as it was in the case of innovation types (Table 10.1), except sharp rise in the shares in case of 'Innovation' and 'R&D' for firms having TO more than Rs. 50 Crores. However, number of firms with TO more than Rs. 50 crores being very few in our sample, the variance was not adequately pronounced to be significant.

Table 10.2: Share of technical manpower in terms of turnover

(Average of all firms)

TO in crores	Overall	Marketing	Finance	HR	Purchase	Store	Admn	Prod/process	R&D	Innovation	Any other
Less than1	12.12	14.26	25.90	16.67	19.97	11.11	13.87	12.10	2.38	4.94	0.00
1 to less 5	31.86	48.53	64.02	53.43	58.24	24.51	18.43	39.89	26.47	5.88	5.88
5 to less 10	39.06	56.69	77.73	78.03	53.41	32.20	28.61	50.27	4.55	9.09	0.00
10 to less 20	40.42	52.94	70.85	66.18	58.73	51.96	38.32	39.69	7.84	0.00	17.65
20 to less 50	44.80	70.83	55.42	75.00	71.67	58.33	44.17	42.40	27.78	0.00	2.38
50 to less 100	44.73	61.85	71.44	78.33	61.11	39.21	24.60	35.22	42.22	33.33	0.00
100 & above	29.44	24.40	54.17	33.33	25.00	0.00	12.50	25.00	70.00	50.00	0.00

Figure 10.2: Share of technical manpower in terms of turnover



Number of manpower (employees) as size of the firm also shows some upward trend in the share of the technical manpower in R&D and Innovation with larger size of the firms. The same upward movement is also seen for other departments, which have been shown as sharing higher technical manpower in earlier cases as well (tables 10.1 and 10.2).

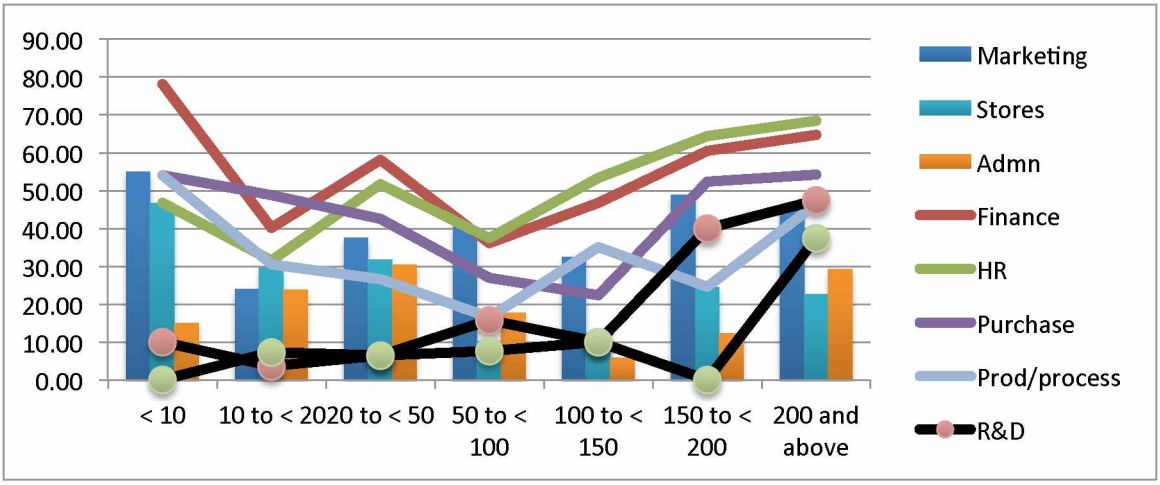
ANOVA result rejects null hypothesis to suggest that there is significant relation between share of technical manpower and firm size measured in terms of manpower ($F=7.70$; $Pr(>F)=1.5e-05$.

Table 10.3: Share of technical manpower in terms of manpower

(Average of all firms)

MP	Over all	Marke ting	Finan ce	HR	Purch ase	Stores	Admn	Prod/pr ocess	R&D	Innov ation	Any other
< 10	31.40	55.00	78.00	46.67	54.00	46.67	15.00	54.00	10.00	0.00	0.00
10 to < 20	24.32	24.07	40.12	31.48	48.77	29.63	23.77	30.51	3.70	7.41	3.70
20 to < 50	29.69	37.57	58.15	51.63	42.49	31.71	30.41	26.70	6.50	6.50	5.23
50 to < 100	21.29	40.38	36.14	37.50	26.92	10.26	17.75	16.56	15.84	7.69	3.85
100 to < 150	22.85	32.50	46.67	53.33	22.33	12.50	6.00	35.16	10.00	10.00	0.00
150 to < 200	32.73	48.81	60.39	64.29	52.38	24.49	12.38	24.59	40.00	0.00	0.00
200 and above	41.59	45.54	64.61	68.33	54.17	22.68	29.17	46.36	47.50	37.50	0.00

Figure 10.3: Share of technical manpower in terms of manpower size



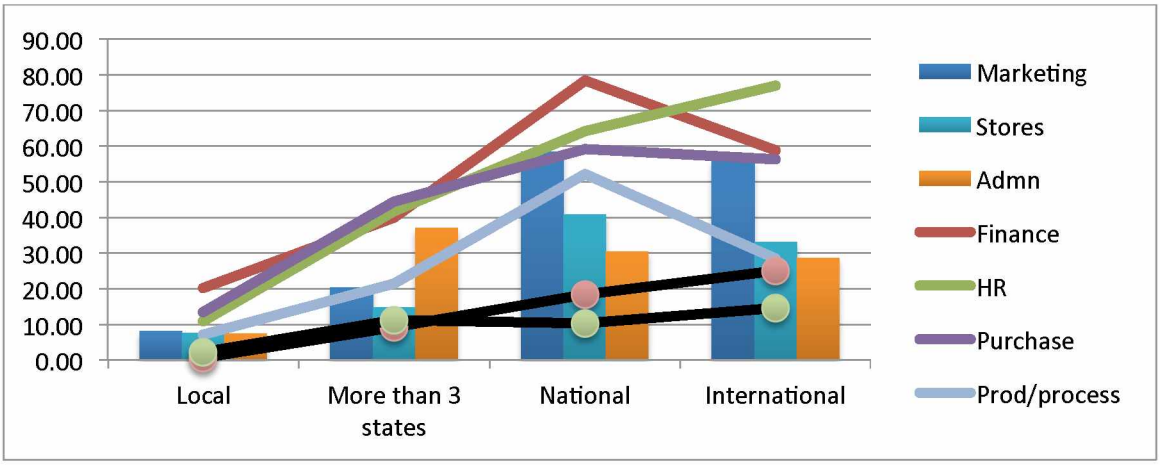
Interesting observation in terms of the market reach (table 10.4 and figure 10.4) of the firms is that shares of technical manpower show upward trend for the firms having international market reach for HR, R&D and Innovation departments. For rest of the departments, however, trend is downward for firms having international market reach. It is somewhat indicative of the higher technological strength needed to reach international market.

Table 10.4: Share of technical manpower in terms of market reach

(Average of all firms)

Market spread	Overall	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/process	R&D	Innovation	Any other
Local	7.74	8.04	20.11	10.87	13.41	7.61	7.43	7.10	0.62	2.17	0.00
More than 3 states	25.12	20.37	40.00	41.67	44.44	14.81	37.04	21.39	9.26	11.11	11.11
National	40.88	58.45	78.36	64.12	59.12	40.82	30.38	52.09	18.37	10.20	6.12
International	37.87	56.17	58.75	76.87	56.34	33.11	28.66	28.50	25.07	14.67	0.57

Figure 10.4: Share of technical manpower in terms of market reach



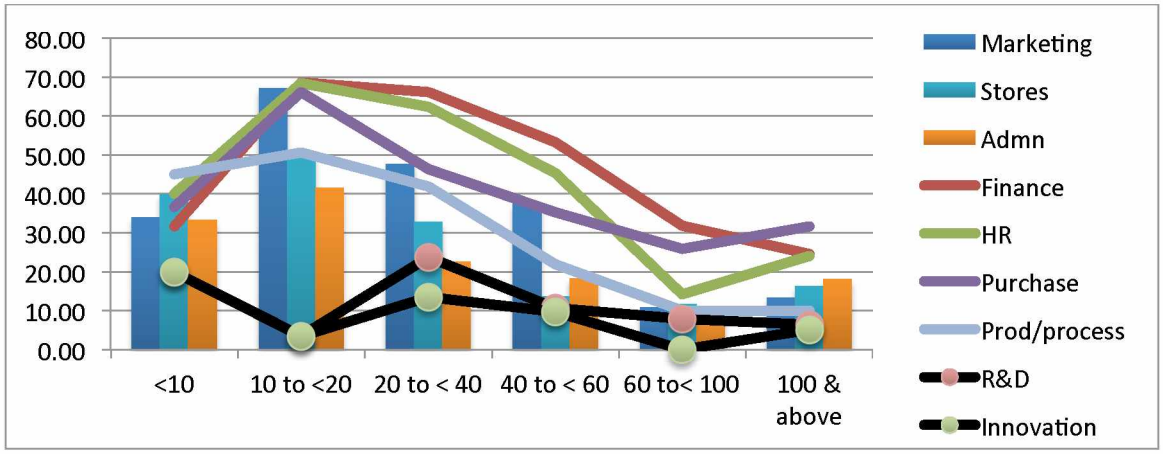
Does intensity of competition faced by a firm influence the practices of the firms? As we have suggested in the beginning that most of the firms studied operate in a competitive market competition, the intensity varies (in a broad sense) for firms facing less than 10 competing firms to more than 100. If we assume, with in our sample, 20 firms competition as moderate intensity, share of technical manpower decreases in all departments beyond 20. This is consistent with textbook economic logic that firms operating in an intense competitive market conditions are price takers, and business dynamics is to create capacity to be able to supply at a given price. Not much innovation activities are expected in such conditions and firms generally try to adopt the general industry practices. This trend is seen in table 10.5 and figure 10.5.

Table 10.5: Share of technical manpower in terms of competition

(Average of all firms)

No. of competing firms	Overall	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/process	R&D	Innovation	Any other
<10	32.07	34.00	31.67	40.00	36.67	40.00	33.33	45.00	20.00	20.00	20.00
10 to <20	42.48	67.11	68.60	68.42	66.24	50.00	41.62	50.57	3.51	3.51	5.26
20 to < 40	35.98	47.64	66.16	62.39	46.40	32.75	22.60	41.91	23.78	13.51	2.70
40 to < 60	24.88	37.54	53.31	45.43	35.22	13.59	18.26	21.85	10.65	9.68	3.23
60 to< 100	9.49	10.78	31.76	14.22	25.88	11.76	9.31	9.96	7.84	0.00	0.00
100 & above	15.01	13.33	24.55	24.00	31.58	16.39	18.08	10.02	6.43	5.00	0.71

Table 10.5: Share of technical manpower in terms of competition



Manpower mobility

Table 11 and figure 11a and 11b show the mobility of technical and non-technical manpower in departments. Negative mobility means attrition whereas positive is addition. Except in the production department, mobility is marginal in most of the departments for both technical and non-technical manpower. In production department 23% firms reported addition whereas 19% firms reported attrition of technical manpower. Tables 11.1 to 11.5 and corresponding figures 11.1 to 11.5 show the manpower mobility in terms of five firm level attributes.

Table 11: Mobility of manpower in departments (% of firm)

Department	Tech manpower			Non-tech manpower		
	Zero	Positive	Negative	Zero	Positive	Negative
Marketing	83.59	7.03	9.38	98.44	0.00	1.56
Finance	87.50	7.03	5.47	100.00	0.00	0.00
HR	89.84	4.69	5.47	93.75	6.25	0.00
Purchase	83.59	9.38	7.03	100.00	0.00	0.00
Stores	95.31	0.78	3.91	98.44	0.00	1.56
Admn	67.97	17.97	14.06	97.66	0.00	2.34
Prod/process	59.38	21.88	18.75	92.19	3.91	3.91
R&D	96.09	0.78	3.13	100.00	0.00	0.00
Innovation	99.22	0.78	0.00	99.22	0.00	0.78
Any other	100.00	0.00	0.00	100.00	0.00	0.00

Figure 11a: Mobility of technical manpower in departments

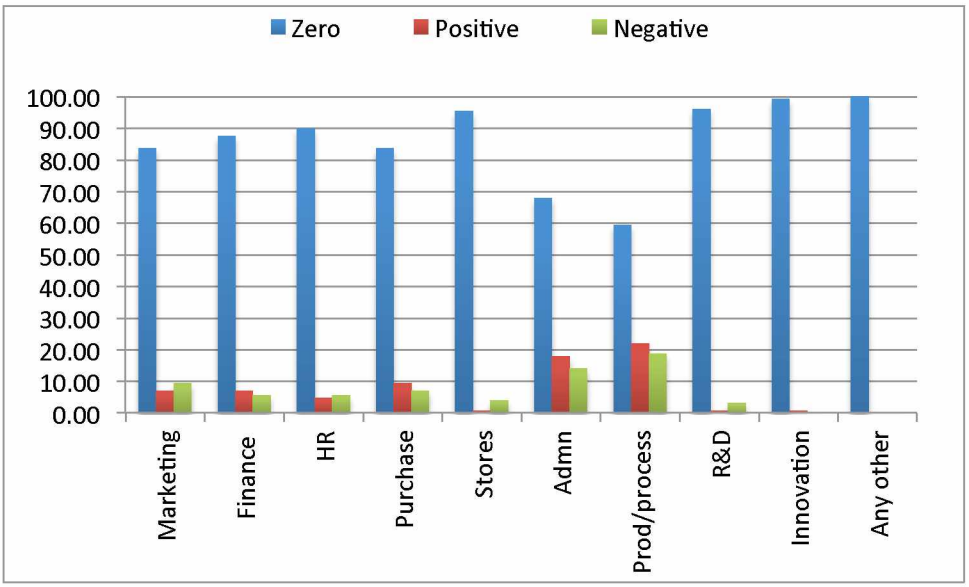
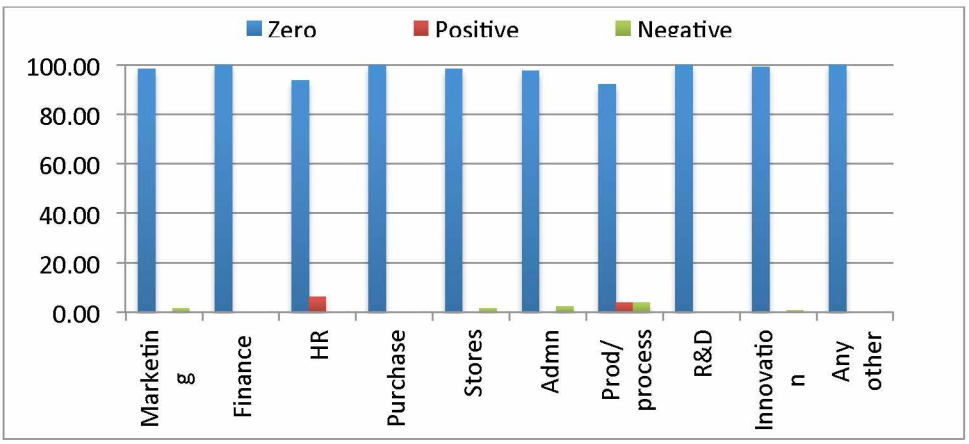


Figure 11b: Mobility of non-technical manpower in departments



In terms of innovation types (table 11.1 and figures 11.1a and 11.1b) roughly 40% to 50% firms within different innovation type categories do not report any addition or attrition of technical manpower. Firms claiming Organisational innovation, although very small in numbers. show substantial addition of technical manpower. In the technical category again, highest percentage of firms claiming addition of technical manpower is in the Alternative Material type of innovation; highest attrition is reported by 35% firms in the New Input use category of innovation. Addition or attrition among non-technical manpower is rare over the innovation types, except in the Process innovation category where about 34% firms have reported addition of non-technical manpower. Similar to technical category, attrition in non-technical manpower is also highest in New Input use innovation type.

Table 11.1: Innovation types and mobility of manpower

Innovation type	Tech			Non-tech		
	Nil	Positive	Negative	Nil	Positive	Negative
Product	47.06	20.59	32.35	76.47	5.88	17.65
Process	43.55	30.65	25.81	43.55	33.87	22.58
Quality	47.46	33.90	18.64	74.58	13.56	15.25
Input use	40.00	25.00	35.00	55.00	10.00	35.00
Alt Material	40.00	40.00	20.00	66.67	13.33	20.00
New Mach	51.19	22.62	26.19	82.14	8.33	9.52
Marketing	58.49	22.64	18.87	81.13	11.32	7.55
Organisation	30.00	70.00	0.00	80.00	20.00	0.00

Figure 11.1a: Innovation types and mobility of technical manpower

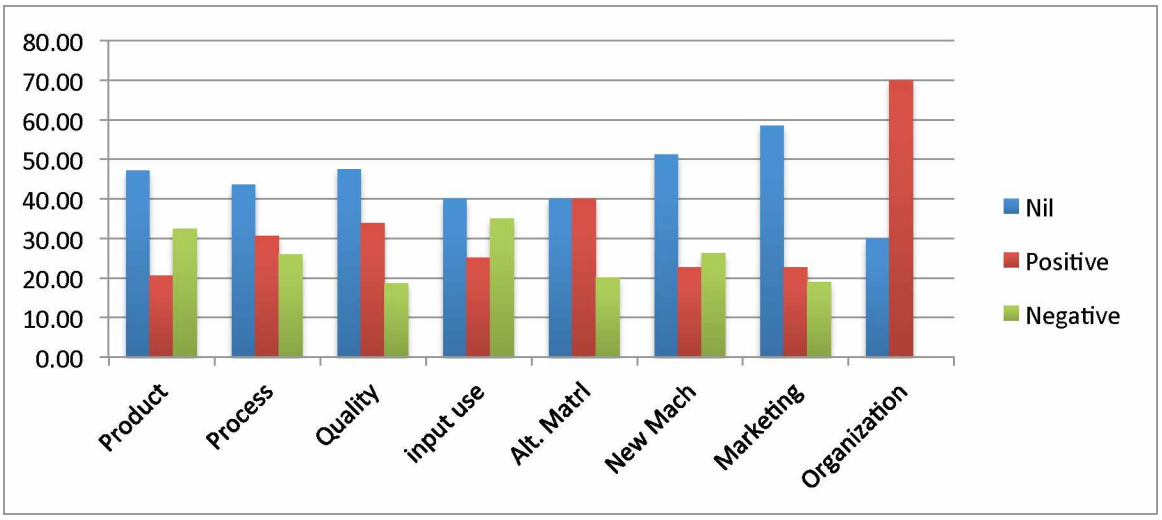
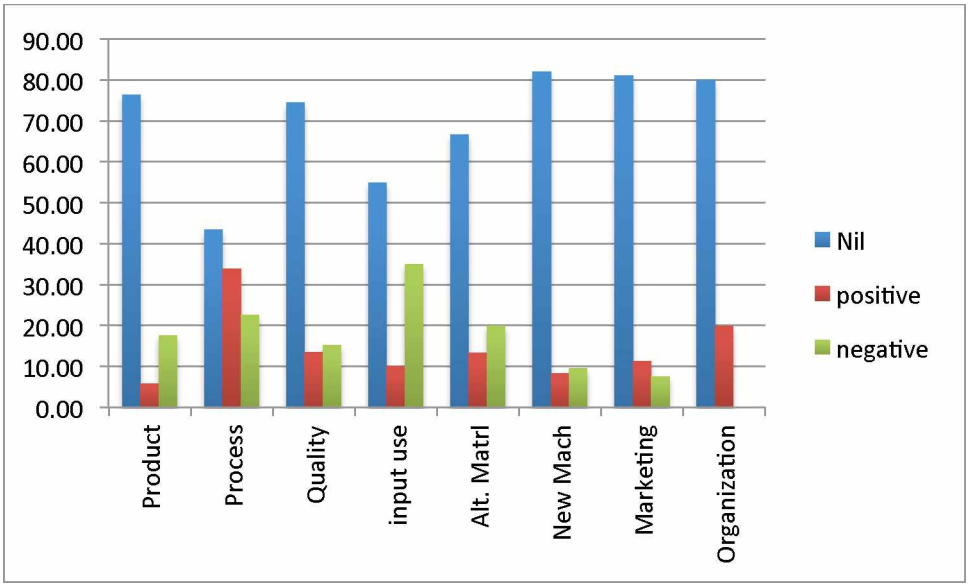


Figure 11.1b: Innovation types and mobility of non-technical manpower



Size of the firms in terms of TO broadly indicate higher percentage of firms in the larger size group have higher share of attrition of both technical and non-technical manpower. Higher percentage of smaller firms reported no change in manpower (both technical and non-technical categories. See table 11.2 and figures 11.2a and 11.2b.

Table 11.2: Firm size (TO) and mobility of manpower

TO in crores	Tech			Non-tech		
	Nil	Positive	Negative	Nil	Positive	Negative
Less than1	25.93	35.19	38.89	88.89	5.56	5.56
1 to less 5	64.71	17.65	17.65	88.24	5.88	5.88
5 to less 10	77.27	4.55	18.18	95.45	0.00	4.55
10 to less 20	35.29	41.18	23.53	70.59	23.53	5.88
20 to less 50	50.00	16.67	33.33	66.67	33.33	0.00
50 to less 100	33.33	33.33	33.33	55.56	22.22	22.22
100 & above	25.00	25.00	50.00	50.00	0.00	50.00

Figure 11.2a: Firm size (TO) and mobility of manpower (tech)

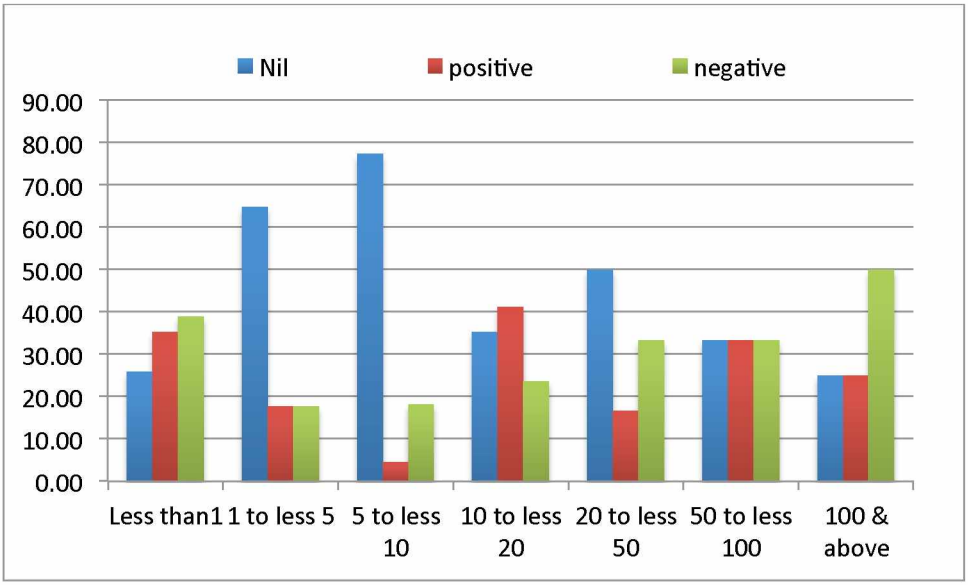
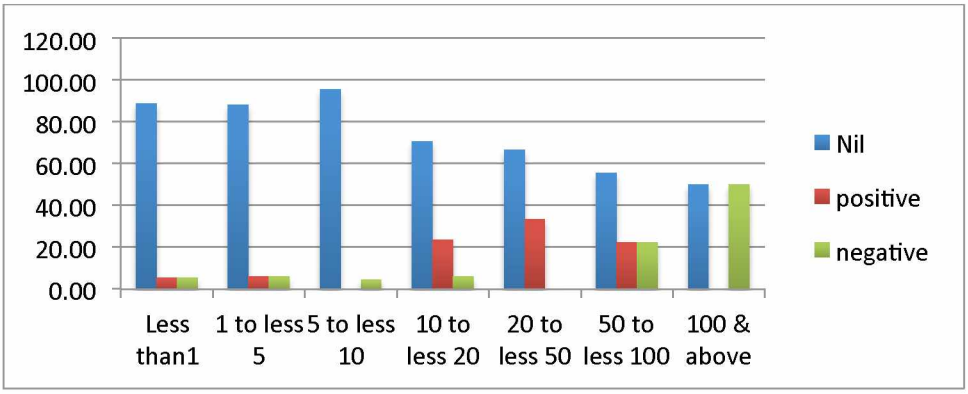


Figure 11.2b: Firm size (TO) and mobility of manpower (non-tech)



When firm size is seen in terms of manpower (table 11.3 and figures 11.3a and 11.3b) no change in the technical and non-technical manpower endowment appears to be the dominant trend; only smaller percentage of larger firms showing addition as well as attrition in the technical manpower category.

Table 11.3: Firm size (MP) and mobility of manpower

	Tech			Non-tech		
Size (MP)	Nil	Positive	Negative	Nil	Positive	Negative
10 and<	91	0	9	100	0	0
11 to<20	50	21	19	88	13	0
20 to <40	46	26	27	74	11	14
40 to <60	63	13	13	100	0	0
60 to <100	35	29	13	76	12	12
100 to <200	35	35	13	76	6	18
200 and above	63	25	6	75	25	0

Figure 11.3a: Firm size (MP) and mobility of technical manpower

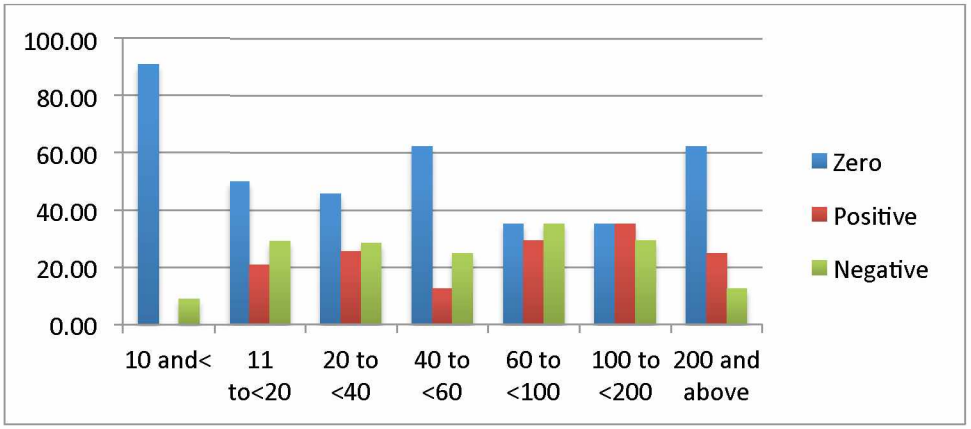
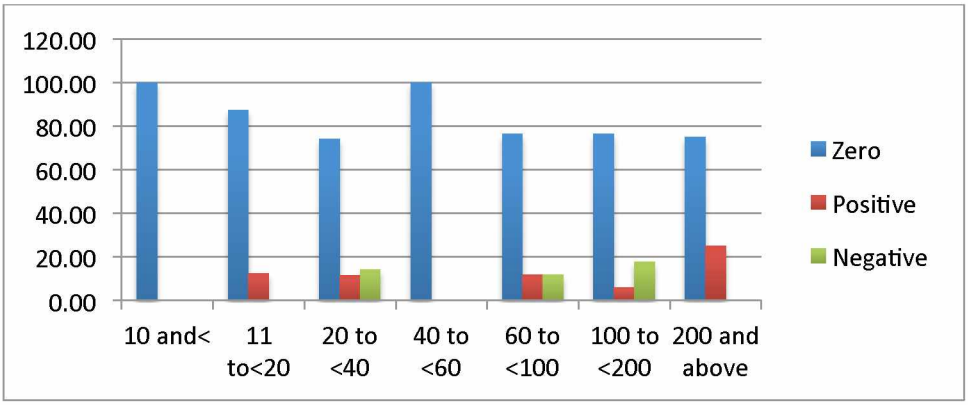


Figure 11.3b: Firm size (MP) and mobility of non-technical manpower



Market reach of the firms and mobility of manpower show some interesting trend in the case of technical manpower (table 11.4 and figures 11.4a and 11.4b). As evident from the figure 11.4a there is addition of technical manpower by higher percentage of firms with only local market as well as firms with international reach. There are hardly any significant changes in the non-technical manpower group.

Table 11.4: Market reach and mobility of manpower

	Tech			Non-tech		
Market Reach	Nil	Positive	Negative	Nil	Positive	Negative
Local	39.13	32.61	28.26	91.30	4.35	4.35
More than 3 states	66.67	22.22	11.11	77.78	11.11	11.11
National	51.02	14.29	34.69	79.59	12.24	8.16
International	56.00	28.00	16.00	76.00	12.00	12.00

Table 11.4: Market reach and mobility of manpower (Tech)

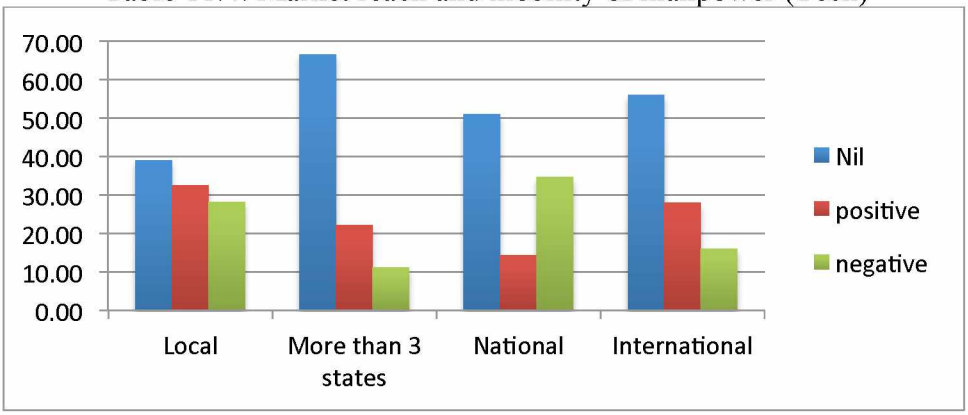
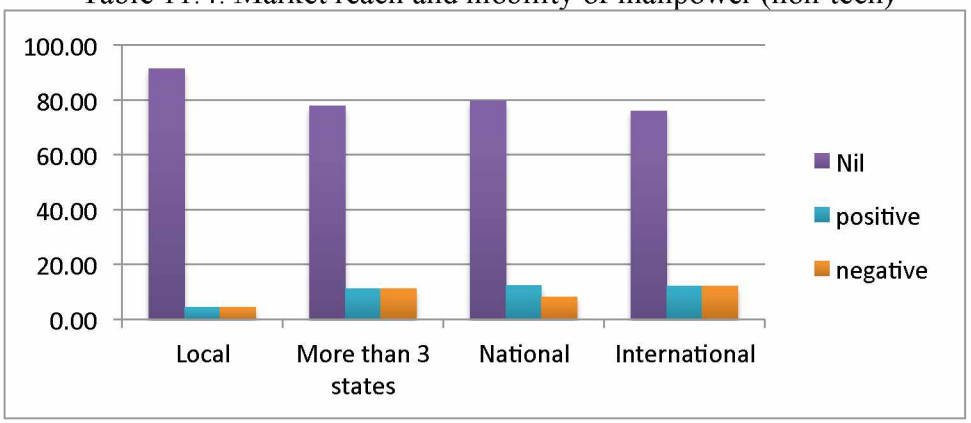


Table 11.4: Market reach and mobility of manpower (non-tech)



In a perfectly competitive market firms operate in a market with given prices both in the input and output markets. In the absence of any price advantage it is expected that in the manpower market attrition would be proportionately replaced with addition. As corollary, lesser the competition more would be firm specific manpower or HR. It is therefore expected that there would less attrition and induction of resources. There is some support to this general understanding of market dynamics in competition and mobility of manpower as shown in table 11.5 and figures 11.5a and 11.5b. There is almost no mobility of the non-technical manpower. In the technical category, there is mobility more or less in similar proportions between addition and attrition.

Table 11.5: Competition and mobility of manpower

Competition intensity	Tech			Non-tech		
	Nil	Positive	Negative	Nil	Positive	Negative
<10	80.00	20.00	0.00	100.00	0.00	0.00
10 to <20	52.63	21.05	26.32	84.21	5.26	10.53
20 to < 40	59.46	16.22	24.32	81.08	10.81	8.11
40 to < 60	48.00	24.00	28.00	80.65	9.68	9.68
60 to< 100	35.29	41.18	23.53	88.24	5.88	5.88
100 & above	35.00	20.00	45.00	80.00	15.00	5.00

Figure 11.5a: Competition and mobility of manpower (tech)

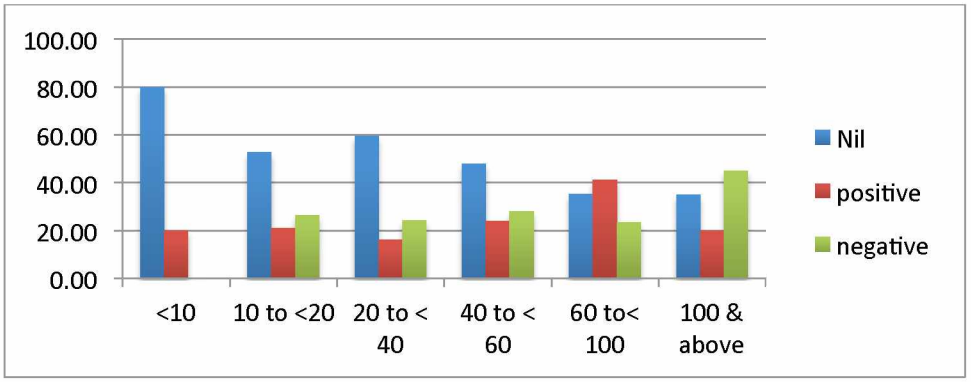
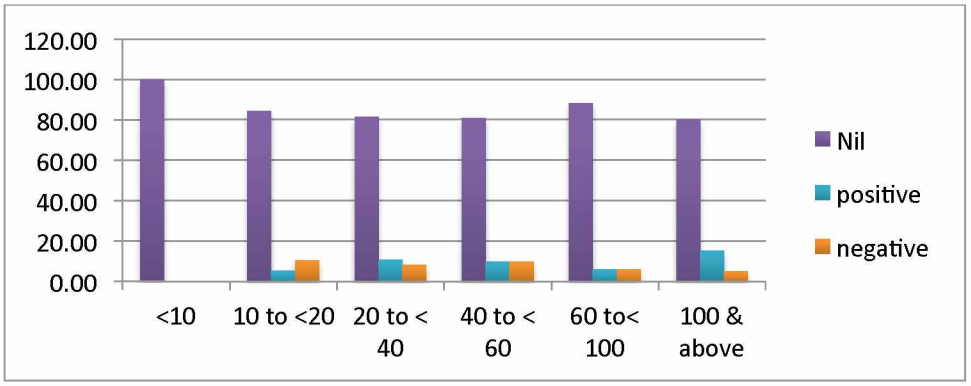


Figure 11.5b: Competition and mobility of manpower (non-tech)



How human resource is organized: Chapter Summary and observation

- The above section has been focused on the question – how human resources are organized within the firms being studied. We look at the human resource endowment of firms, technical and non-technical manpower, how they are deployed over departments, addition, and attrition of manpower.
- 90% firms do not have any innovation department, 85% do not have any R&D division. In case of 43% firms more than 60 % workforce is deployed in the shop floor.
- 35% firms do not have any technical manpower even in the production units. However, about 19% firms have 80% technical manpower in the production units.
- Firms claiming Product innovations show higher share of technical manpower, followed by firms in Process innovations and New Machine types.
- Firms having more than Rs. 50 crore TO show higher share of technical Manpower in Innovation and R&D. Number of manpower (employees) as size of the firm also shows some upward trend in the share of the technical manpower in R&D and Innovation with larger size of the firms.

- Shares of technical manpower show upward trend for the firms having international market reach for HR, R&D and Innovation departments. For rest of the departments, however, trend is downward for firms having international market reach. It is somewhat indicative of the higher technological strength needed to reach international market.
- Share of technical manpower decreases in all departments for firms competing with number of competitors beyond 20.
- Mobility of manpower in terms of numbers added and number of attrition does not show much movement of technical manpower. It is much less in the case of non-technical manpower. The scenario does not change much when examined in terms of innovation types.
- In terms of size of the firm (TO) larger firms show more addition and attrition compared to smaller firms for both technical and non-technical manpower. Similar is the trend when size is measured with MP.
- There is addition of technical manpower in cases of firms with local and international market reach.
- There is almost no mobility of the non-technical manpower when examined with competition intensity. In the technical category, there is mobility more or less in similar proportions between addition and attrition.

Observation

Overall picture is that of sluggishness; a situation of status quo of a perfectly competitive market. Variations over the firms (different attributes taken into consideration), if any, is easier to overlook than take note of. There is indication that firms involved in product and process innovation are more inclined to employ skilled manpower. Also demand for skill increases with higher size, and wider market reach of the firms. It is also indicative of the fact that adequate impetus to growth and availability of skilled manpower coupled with wider market reach can make SMEs more innovation oriented. A few studies that are available on Human Resource issues in Indian SMEs also indicate the lack of mobility of manpower. In effect it indicates the lack of technology related activities in Indian industries. As we shall see, the same is reflected in technology initiatives of the firms, and also in skill development through training of manpower.

B. How HR is nurtured by the innovative firms?

How HR is nurtured?

Summary Observation

Issues examined are informatisation; role of the employees in Decision Making; Incentives and Facilities; Training and Skill development.

Overall picture suggests a sleepy, uneventful atmosphere. Firms practice the same things that become industry survival norm. There is ICT enabled MIS for most of the firms, but decision making is solely in the hand of the owner/proprietor. Most of the firms claim the same extent and types of incentives, there is no industry leader as attractive employer. The industry in general does not provide career prospect, or skill development; most of them do not access the available training and skill development opportunities. As such, from innovation peRs.pective, the scenario is not encouraging for gains in productivity or

In this section we examine the extent of informatisation; role of the employees in Decision Making; Incentives and Facilities; Training and Skill development.

Extent of Informatisation

Flow of information within the firm is an important way of involving the workforces in the activities of the firm with a sense of belonging. It is also a way to make them part of the decision-making, and smart ways to extract inputs from the workers. The extent of informatisation has been assessed in terms of use of ICT and MIS. We examine the extent of informatisation for five firm level attributes.

Tables 12.1 to 12.5 show ICT and MIS use for firms classified by selected attributes.

Across innovation types on an average 68% firms claim to have MIS in place, highest is 87% for firms in "Alternative Material' innovation group, followed by 'Marketing' innovation group (85%), and 'Process' innovation group (81%). Most of the firms claim that the MIS connect all staffs (Table 12.1).

Table 12.1: ICT and MIS (% of firms) in Types of innovation

Innovation types	MIS in place	ICT enabled	Mgt staff	Mgt and Acct	All Staff	Separate Dept
Prod	76	68	79	9	76	59
Process	81	66	87	5	90	58
Qlty	68	56	86	8	85	69
Input	65	60	70	15	70	60
Alt mat	87	80	87	20	80	73
New Mach	78	66	89	6	92	58
Mkt	85	74	85	8	83	68
Org	60	40	80	20	60	40

In terms of TO (Table 12.2), larger the firms size more firms have MIS. Only 39% firms in the smallest firm category claim having MIS. In case of largest firms, only about 50% firms connect all staffs; while in other groups of firm sizes, coverage is more widely spread.

Table 12.3: ICT and MIS (% of firms) in Size of firms (TO)

TO in crores	MIS in place	ICT enabled	Mgt staff	Mgt and Acct	All	Separate Dept
Less than1	38.89	22.22	1.85	5.56	96.30	51.85
1 to less 5	76.47	82.35	0.00	5.88	94.12	70.59
5 to less 10	90.91	90.91	4.55	4.55	90.91	81.82
10 to less 20	100.00	88.24	0.00	11.76	94.12	70.59
20 to less 50	100.00	100.00	16.67	16.67	100.00	100.00
50 to less 100	100.00	88.89	0.00	0.00	100.00	77.78
100 & above	100.00	50.00	50.00	50.00	50.00	50.00

In case of size of the firm in terms of MP (Table 12.3), the scenario is different from that in terms of TO. There is no indication that larger firms are better adopters of MIS. However, most of the adopters firms claim that MIS is not selective, and covers all departments and employees.

Table 12.3: ICT and MIS (% of firms) in Size of firms (MP)

Size (MP)	MIS in place	ICT enabled	Mgt staff	Mgt and Acct	All	Separate Dept
10 and<	90.91	72.73	9.09	18.18	81.82	54.55
11 to<20	50.00	45.83	0.00	4.17	100.00	66.67
20 to <40	74.29	60.00	2.86	8.57	94.29	77.14
40 to <60	68.75	62.50	6.25	6.25	100.00	62.50
60 to <100	58.82	35.29	5.88	5.88	88.24	41.18
100 to <200	70.59	70.59	0.00	5.88	100.00	64.71
200 and above	100.00	100.00	0.00	12.50	100.00	100.00

Table 12.4 indicates that firms having wider market reach are more inclined towards ICT enabled MIS with separate departments. Smaller percentage of firms with narrower market reach have MIS.

Table 12.4: ICT and MIS (% of firms) in Market reach

Market	MIS in place	ICT enabled	Mgt staff	Mgt and Acct	All	Separate Dept
Local	41.30	15.22	2.17	2.17	97.83	50.00
More than 3 states	44.44	44.44	11.11	11.11	66.67	44.44
National	93.88	89.80	2.04	10.20	95.92	83.67
International	84.00	84.00	8.00	16.00	92.00	68.00

Another interesting observation regarding MIS is that higher the intensity of competition lower is the preference for MIS (table 12.5). This is consistent with the behavior of a firm in a perfectly competitive market, where firms earn normal profit by supplying at the ruling price. Whereas a firm retains or gains competitive advantage (lesser competition intensity) by creating firm specific advantages, which would include among other things ICT enabled MIS.

Table 12.5: ICT and MIS (% of firms) in Competition

Crowd	MIS in place	ICT enabled	Mgt staff	Mgt and Acct	All	Separate Dept
<10	80.00	0.00	20.00	20.00	60.00	20.00
10 to <20	73.68	73.68	5.26	5.26	89.47	63.16
20 to < 40	83.78	75.68	0.00	5.41	100.00	83.78
40 to < 60	88.00	88.00	0.00	8.00	124.00	100.00
60 to< 100	35.29	29.41	0.00	0.00	100.00	35.29
100 & above	65.00	40.00	15.00	20.00	80.00	50.00

Decision Making

One important indicator of firms' work culture with respect to nurturing human resources is the importance given to the employees in the process of decision making. Active participation of employees in the process of decision making inculcates the sense of belongingness; makes execution of the growth process smoother. We have examined the practice of decision making using several ways of involving employees; ranging from Proprietor alone to formal and informal ways of using inputs from the employees. Different means of involvement of employees are – Senior management, Market department, All departments, Workers' internal forum, Informal inputs from workers, Inputs from Financiers, involving professional consultants, using inputs from the clients, using inputs from govt. consultants. As we shall see for all the attributes it is proprietor level decision-making, which is the most prevalent practice.

Tables 13.1 to 13.5 examine the firms' practices in this regard in terms of the selected attributes.

In terms of innovation types decision making is mainly proprietors' job for all main types of innovations (table 13.1). In case of product innovation, however, there is significant role of professional consultants for about 59% firms, and in some cases (29%) departments are involved. The same is negligible in case of other types of innovations.

ANOVA results, however show that when one innovation type is seen vis-à-vis other innovation types, then all innovation types show significant relation between extent of

centralization and types of innovation, as shown in table 13. The relationship is strongest in case of product innovation, input use and Alterative material use. Although smaller F values relationship is significant in cases of New Machine, Marketing and Organisational innovations.

Table 13: ANOVA result for innovation types and centralization in decision making

Innovation Types	F	Pr(>F)
Prod	27.27	7.01e-07
Process	9.058	0.003
Qlty & Std	10.43	0.002
Input	24.38	2.43e-06
Alt mat	14.24	0.0002
New Mach	3.88	0.051
Mkt	8.8	0.003
Org	6.33	0.013

Table 13.1: Decision making (who are involved % of firms) and types of innovation

Innovation	Prop	Senior mgt	Market dept	All dept	Worker internal forum	Informal inputs from worers	Fina ncier	Professional consultant
Prod	79	12	18	29	18	12	15	59
Process	92	16	6	3	3	5	2	11
Qlty & Std	97	15	7	3	3	5	2	12
Input	95	25	15	10	10	15	0	20
Alt mat	93	20	20	7	13	13	0	13
New Mach	98	11	4	2	2	4	0	6
Mkt	66	15	4	4	4	6	0	8
Org	30	10	10	10	10	0	20	10

In terms of TO (table 13.2), irrespective of the size of the firms, decision making remains with the proprietors. However, for smaller firms there are cases, although for small percentage of firms, of involving other management staffs, clients, professional consultants, and govt departments. In cases of large firms proprietors are the sole decision maker.

Table 13.2: Decision making (who are involved % of firms) and Size of firm (TO)

TO	Prop	Mgt	Mkt	All Dept	worker informal	Work formal	Fina ncier	Prof conslt	Conslt from client	Conslt Govt
Less than1	98.15	9.26	0.00	1.85	0.00	1.85	0.00	3.70	5.56	1.85
1 to less 5	94.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.76	0.00
5 to less 10	100.00	22.73	13.64	4.55	9.09	9.09	4.55	18.18	0.00	9.09
10 to less 20	100.00	0.00	0.00	0.00	0.00	0.00	0.00	5.88	5.88	0.00
20 to less 50	83.33	16.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50 to less 100	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100 & above	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

When measured in terms of MP (table 13.3), the scenario remains the same except a small percentage of firms across the sizes involving management divisions in the process of decision making.

Table 13.3: Decision making (who are involved % of firms) and Size of firm (MP)

MP	Prop	Mgt	Mkt	All Dept	worker informal	Work formal	Fina ncier	Prof conslt	Conslt from client	Conslt Govt
< 10	90.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	10.00
10 to < 20	100.00	14.81	7.41	0.00	3.70	7.41	3.70	11.11	3.70	0.00
20 to < 50	97.56	2.44	2.44	0.00	0.00	0.00	0.00	2.44	4.88	2.44
50 to < 100	100.00	7.69	0.00	3.85	0.00	0.00	0.00	3.85	0.00	0.00
100 to < 150	90.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150 to < 200	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.29	0.00
200 and above	100.00	12.50	12.50	12.50	12.50	12.50	0.00	25.00	0.00	12.50

Same picture emerges for firms in terms of market reach (table 13.4), for firms operating only in the local market, 100% show proprietor level decision making. It is little less for firms with wider market reach.

Table 13.4: Decision making (who are involved % of firms) and Market reach

Market	Prop	Mgt	Mkt	All Dept	worker informal	Work formal	Financier	Prof conslt	Conslt from client	Conslt Govt
Local	100.00	4.35	0.00	0.00	0.00	0.00	0.00	2.17	0.00	2.17
More than 3 states	88.89	22.22	11.11	0.00	11.11	11.11	0.00	0.00	0.00	11.11
National	97.96	4.08	0.00	0.00	2.04	0.00	0.00	6.12	4.08	0.00
International	96.00	20.00	8.00	4.00	4.00	4.00	4.00	16.00	4.00	8.00

The competition intensity faced by a firm does not change the work culture (table 13.5), proprietors are the decision makers across various degrees of competition. Firms with lesser competition, in 40% of cases claim to consult the clients for decision making.

ANOVA results reject the null hypothesis to suggest that there is significant relationship between extent of centralization in decision making and market competition faced by the firms ($F = 23.64$; $Pr(>F) = 3.36e-06$).

Table 13.5: Decision making (who are involved % of firms) and Competition

Crowd	Prop	Mgt	Mkt	All Dept	worker informal	Work formal	Financier	Prof conslt	Conslt from client	Conslt Govt
<10	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00
10 to <20	94.74	5.26	5.26	0.00	0.00	0.00	0.00	5.26	5.26	5.26
20 to < 40	100.00	8.11	0.00	0.00	0.00	2.70	0.00	8.11	2.70	5.41
40 to < 60	100.00	20.00	4.00	8.00	4.00	4.00	4.00	12.00	8.00	0.00
60 to< 100	94.12	5.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100 & above	100.00	0.24	0.48	0.00	0.24	0.24	0.00	0.00	0.00	0.00

Incentives to the employees

Incentives are important tools for creating firm specific human resources. Incentives can be divided in two broad groups: Financial and non-financial. In non-financial category we include those types of incentives which bring financial gains in terms of general well being and future of the employees and families. Thus financial incentives include salary, financial award, career prospect, stake in the company, and stake in the innovation by any employee or group of employees. In the non-financial category we have included opportunities for training, new skill development, job security, Family Health related incentives, and help in education of the employees' children. Two sets of incentives are shown differently as incentive 'a' for financial and 'b' for non-financial in the tables 14.1 to 14.5 for five firm level attributes.

Table 14.1a and 14.1b show innovation type-wise financial and non-financial incentives given by firms. Most firms in all innovation types claim giving best salary in the industry and also financial awards on the basis of the performance. Fewer firms, however, claim offering stake in the company or stake in the innovation.

Most of the firms claim providing non-financial incentives like training and new skill development, and also job security. Incentives like help for children education is comparatively less prevalent (table 14.1b)

Table 14.1a: Financial incentives and types of innovation

Type	Best salary	Stake in Innov	Fin award	Career pros	Stake in Co
Prod	91	59	79	65	56
Process	94	21	74	52	58
Qlty	97	31	69	46	46
Input	90	55	75	75	55
Alt mat	93	67	60	47	73
New Mach	94	23	76	46	60
Mkt	92	26	74	51	51
Org	70	20	90	80	50

Table 14.1b: Non-financial incentives and types of innovation

Type	Trg prog	New skill	Job Security	Health	Help in education
Prod	82	82	74	76	41
Process	69	74	58	82	39
Qlty	61	63	51	69	31
Input	80	85	75	65	35
Alt mat	80	73	67	80	40
New Mach	69	69	58	86	40
Mkt	79	81	64	81	28
Org	80	90	70	80	40

When seen in terms of the size of the firm (TO), again firms across the sizes claim to give best salary in the industry, so is financial award (14.2a). On the other hand career prospect as incentive is much less prevalent among small firms. Stake in innovation is rare; where as stake in company is less practiced among larger firms.

Size of the firms also matters for non-financial incentives (table 14.2b). Training programme for employees and opportunities for new skill development are more visible among larger firms. While health related support is common for firms of all sizes; education support for children of the families of the employees is rare.

Table 14.2a: Financial incentives and size of firms (TO)

TO in crores	Best salary	Stake in Innov	Fin award	Career pros	Stake in Co
Less than1	87.04	18.52	88.89	18.52	51.85
1 to less 5	100.00	29.41	58.82	41.18	41.18
5 to less 10	95.45	9.09	59.09	45.45	45.45
10 to less 20	100.00	35.29	70.59	70.59	70.59
20 to less 50	100.00	16.67	83.33	50.00	66.67
50 to less 100	100.00	11.11	88.89	55.56	44.44
100 & above	100.00	25.00	75.00	100.00	0.00

Table 14.2b: Non-financial incentives and size of firms (TO)

TO in crores	Trg prog	New skill	Help education	Job Security	Health
Less than1	31.48	27.78	35.19	33.33	70.37
1 to less 5	64.71	64.71	23.53	58.82	76.47
5 to less 10	77.27	77.27	18.18	45.45	81.82
10 to less 20	82.35	82.35	35.29	64.71	82.35
20 to less 50	100.00	100.00	33.33	66.67	100.00
50 to less 100	66.67	100.00	33.33	77.78	88.89
100 & above	100.00	100.00	25.00	50.00	75.00

In terms MP as size of the firm, there is no apparent relation with various types of financial incentives. But for non-financial incentives, it is somewhat observed that bigger firms are more visible in training programme, skill development, health and job security, but not different for help in education of the children of the employee families.

Table 14.3a: Financial incentives and size of firms (MP)

Size (MP)	Best salary	Career pros	Fin award	Stake in Co	Stake in Innov
< 10	80.00	10.00	70.00	40.00	10.00
10 to < 20	85.19	33.33	81.48	40.74	18.52
20 to < 50	100.00	51.22	82.93	63.41	26.83
50 to < 100	92.59	37.04	40.74	55.56	100.00
100 to < 150	90.00	30.00	60.00	40.00	10.00
150 to < 200	100.00	14.29	71.43	42.86	28.57
200 and above	100.00	75.00	50.00	25.00	12.50

Table 14.3b: Non-financial incentives and size of firms (MP)

Size (MP)	Trg prog	New skill	Help education	Health	Job Security
< 10	40.00	40.00	20.00	50.00	30.00
10 to < 20	51.85	44.44	11.11	62.96	37.04
20 to < 50	65.85	68.29	39.02	90.24	56.10
50 to < 100	51.85	48.15	44.44	70.37	55.56
100 to < 150	50.00	80.00	30.00	80.00	20.00
150 to < 200	57.14	57.14	42.86	100.00	57.14
200 and above	87.50	87.50	12.50	75.00	62.50

As shown in tables 14.4a and 14.4b financial incentives are more pronounced in cases where firms have wider market reach. This is also true for non-financial incentives, except for help in education.

Table 14.4a: Financial incentives and Market reach

Market	Best salary	Career pros	Fin award	Stake in Innov	Stake in Co
Local	86.96	15.22	26.09	97.83	47.83
More than 3 states	88.89	55.56	66.67	11.11	33.33
National	97.96	51.02	71.43	28.57	51.02
International	100.00	56.00	64.00	36.00	60.00

Table 14.4b: Non-financial incentives and market reach

	Trg prog	New skill	Job Security	Help education	Health
Local	26.09	28.26	30.43	36.96	71.74
More than 3 states	66.67	55.56	55.56	33.33	66.67
National	73.47	73.47	57.14	28.57	85.71
International	84.00	88.00	60.00	20.00	76.00

Table 14.5a examines the financial incentives for competition intensity faced by firms. There is indication that firms with stronger hold on the market (lesser competition intensity) are also better in providing financial incentives to the employees. This is also true for non-financial incentives except for educational help (14.5b).

Table 14.5a: Financial incentives and competition intensity

Crowd	Best salary	Career pros	Fin award	Stake in Innov	Stake in Co
<10	100.00	60.00	60.00	20.00	40.00
10 to <20	100.00	63.16	68.42	52.63	47.37
20 to < 40	97.30	78.38	100.00	0.00	56.76
40 to < 60	100.00	28.00	88.00	16.00	48.00
60 to< 100	82.35	23.53	94.12	5.88	41.18
100 & above	80.00	40.00	80.00	25.00	70.00

Table 14.5b: Non-financial incentives and competition intensity

Competition Intensity	Trg prog	New skill	Help education	Health	Job Security
<10	100.00	100.00	40.00	80.00	100.00
10 to <20	73.68	73.68	26.32	73.68	47.37
20 to < 40	62.16	45.95	35.14	72.97	56.76
40 to < 60	68.00	68.00	24.00	100.00	40.00
60 to< 100	29.41	35.29	35.29	70.59	29.41
100 & above	50.00	55.00	35.00	85.00	60.00

Training of employees

Innovation is all about doing things 'new'. The bottom line is doing something new at least at the firm level. Firms, therefore, acquire new knowledge and skill. Training of employees is the mainstay of acquiring knowledge and skill. Over all training scenario for all firms taken together is presented in table 15. The table presents percentage of employees trained in percentage of firms (total percentage of firms is shown in 2nd column. Rest of the columns at the right shows percentage of total percentage of firms). It is to be noted that for 30% of the firms training activities are non-existent. About 2% firms provided training to 40 to 60% of its employees. As expected, most of the training is for the production/process department, followed by training in Administration.

Table 15: Training of employees in different departments

% trained	% of total firms	Mkt	Fin	HR	Purc hase	Stores	Admn	Prod/ proce	R&D	Innv	Other
0.00	30	72	84	79	78	85	59	36	92	95	95
up to 5	9	18	8	13	15	9	27	9	5	4	2
5 to 10	17	5	4	4	5	4	11	14	2	1	2
10 to 20	22	2	3	4	2	2	3	28	1	1	2
20 to 40	13	2	2	0	1	1	0	9	0	0	0
40 to 60	2	0	0	0	0	0	0	3	0	0	0
60 to 80	4	1	0	0	0	0	0	3	0	0	0
80 to 100	0	0	0	0	0	0	0	0	0	0	0

When seen in terms of innovation types (table 15.1) it is not product or process innovation types where firms are active in training its manpower. Firms in Input Use, Quality and Standard, and Marketing innovation types, in that order, are most active in training employees. Again training activities are mostly in Product/process department, distantly followed by Administration and marketing departments.

ANOVA results are as follows:

Null hypotheses - equal average manpower trained in a particular innovation type vis-à-vis other innovation types. Null rejected for innovation types 'Quality and Standard' (F=4.54; Pr(F>)= 0.035), (F=4.54; 'Input use'(F=4.89; Pr(F>)= 0.028); and 'Marketing'(F=5.94; Pr(F>)= 0.016) innovations. For all other innovation types null is accepted. This suggests that there is significant relation between manpower trained and innovation types like 'Quality and Standard'; 'Input use'; and 'Marketing'. And it is not so in other types of innovations.

Table 15.1: Training of employees and innovation types

Innovation	% of total firm	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/ process	R&D	Innovation	Any other
Prod	14.39	3.68	0.99	0.68	0.91	0.56	2.07	9.47	0.96	0.39	0.09
Process	14.67	2.15	1.46	0.88	1.19	0.75	2.39	8.72	0.65	0.38	0.63
Qlty	17.89	2.97	1.84	0.92	1.48	1.05	2.81	11.96	0.63	0.40	0.54
Input	22.77	2.20	3.71	2.13	2.39	1.73	3.40	11.11	1.82	0.78	1.04
Alt mat	12.03	0.80	2.00	1.35	0.71	1.10	3.62	5.30	0.66	0.17	1.20
New Mach	13.43	1.49	1.13	0.92	1.22	0.77	1.82	10.96	0.30	0.25	0.53
Mkt	20.39	3.92	2.95	1.81	1.96	1.48	2.59	9.52	0.45	0.41	0.44
Org	26.89	4.51	2.83	1.22	2.50	0.57	2.94	10.52	2.13	0.81	0.29

There is not much notable difference in employees' training activities over firms of different sizes (TO). Firms with more than Rs.100cr Turn Over show highest percentage of firms giving training to their employees. They are followed by firms in Rs.20 to 50cr and Rs.5 to 10cr categories. While the preference of department (product/process followed by Administration and marketing departments) for training shows the same pattern, higher percentage of firms opting for marketing training is noticed in cases of firms in middle size categories (that is in the categories like Rs. 10 -20; 20 – 50 and 50 – 100cr categories).

Table 15.2: Training of employees and size of firms (TO)

TO in crores	% of total firm	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/ process	R&D	Innovation	Any other
Less than1	12.85	0.80	0.36	0.28	0.47	0.21	2.01	15.06	0.13	0.09	0.39
1 to less 5	9.21	0.36	0.16	0.64	0.91	0.75	2.12	5.23	0.07	0.00	0.00
5 to less 10	19.41	2.91	1.58	1.82	2.27	1.16	2.48	10.53	0.00	0.07	0.00
10 to less 20	18.40	4.95	2.84	1.60	1.12	1.88	1.72	11.95	0.00	0.00	0.33
20 to less 50	20.96	4.00	5.66	3.71	3.06	2.61	2.30	6.67	0.85	0.43	2.99
50 to less 100	15.07	4.11	2.36	0.26	2.42	0.83	0.81	4.93	0.63	0.79	0.00
100 & above	36.27	2.69	2.97	1.01	1.18	2.24	1.59	14.81	5.64	3.41	0.73

It is interesting to observe that firms with larger manpower are least active in training their employees (table 15.3). Smaller firms (in terms of manpower are comparatively more inclined training their employees. Training pattern, however, remain the same; mostly the product/process department. There is indication that smaller firms are also interested in training in marketing.

Table 15.3: Training of employees and size of firms (MP)

MP	% of total firm	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/process	R&D	Innovation	Any other
< 10	10.83	3.47	0.00	2.36	2.22	1.11	0.00	9.84	0.00	0.00	0.00
10 to < 20	21.19	2.05	2.52	1.32	2.66	1.52	2.38	13.96	0.00	0.26	0.21
20 to < 50	19.85	2.95	1.91	0.96	0.73	0.98	2.40	13.23	0.41	0.47	0.71
50 to < 100	10.79	0.73	0.43	0.52	0.45	0.41	2.52	9.96	0.16	0.06	0.38
100 to < 150	13.45	1.92	0.67	0.29	0.82	0.29	1.17	15.66	1.65	0.10	0.29
150 to < 200	5.97	0.61	0.71	0.54	0.52	0.68	1.33	5.16	0.26	0.00	0.00
200 and above	5.72	1.96	0.41	0.43	0.86	0.34	0.79	1.38	0.28	0.07	0.00

From table 15.4 it appears that firms having wider market spread are more active in training their employees (20.55% firms). ANOVA result does not support any such

relation. Null hypothesis – there is equal average trained manpower across market spread of firms - is accepted with F = 2.36; Pr(>F) = 0.074. The result is balanced by similar training activities by firms having local markets and international markets.

Table 15.4: Training of employees and market reach of firms

Market	% of total firms	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/ process	R&D	Innovation	Any other
Local	13.06	0.32	0.26	0.21	0.47	0.06	1.80	14.88	0.09	0.10	0.46
More than 3 states	8.84	2.72	1.26	0.20	1.11	0.30	1.67	5.88	0.00	0.00	0.00
National	20.55	3.72	2.24	1.84	2.14	1.72	1.97	12.06	0.48	0.41	0.17
International	12.40	1.90	1.58	0.81	0.71	0.96	2.45	6.09	0.54	0.18	0.72

Although ANOVA did not give any definite results there are indications that firms facing comparatively lower intensity of competition are more active in training their employees (as evident from the fact that at 36.27%, firms with least competition have the highest rate of providing training). This can also be interpreted as – these firms owe their competitive position to their trained manpower.

Table 15.5: Training of employees and competition intensity

Competition	% of total firm	Marketing	Finance	HR	Purchase	Stores	Admn	Prod/ process	R&D	Innovation	Any other
<10	36.27	2.69	2.97	1.01	1.18	2.24	1.59	14.81	5.64	3.41	0.73
10 to <20	16.44	5.66	2.08	2.22	3.40	2.37	2.85	7.89	0.15	0.00	0.45
20 to < 40	19.47	2.98	2.36	1.38	1.40	1.23	2.55	9.96	0.55	0.23	0.27
40 to < 60	15.66	0.75	0.20	0.22	0.40	0.29	1.39	14.93	0.10	0.20	0.36
60 to< 100	8.96	0.50	0.00	0.11	0.00	0.00	1.68	11.58	0.00	0.00	0.00
100 & above	15.16	0.69	1.96	0.86	1.10	0.70	1.77	14.31	0.76	0.73	0.90

Support Accessed for training of manpower

As shown in table 16, only a very small percentage of firms accessed external support for training their employees; and mostly depended on their in-house expertise. While some firms (about 10%) approached government agencies for training in purchase, similar percentage of firms approached professional agencies for marketing and also for finance related training.

Table 16: Support accessed for different types of training

	Inhouse	Govt Agency	R&D Instt	Professional Body	Supplier	Client
Marketing	85.71	2.38	0.00	9.52	0.00	2.38
Finance	86.96	4.35	0.00	8.70	0.00	0.00
HR	96.43	0.00	0.00	3.57	0.00	0.00
Purchase	90.32	9.68	0.00	0.00	0.00	0.00
Stores	100.00	0.00	0.00	0.00	0.00	0.00
Admn	95.45	2.27	0.00	2.27	0.00	0.00
Prod/process	96.88	3.13	0.00	0.00	0.00	0.00
R&D	77.78	11.11	0.00	11.11	0.00	0.00
Innovation	100.00	0.00	0.00	0.00	0.00	0.00

Firms categorized in terms of innovation types show that only some firms engaged in 'Input use' type of innovation have approached various government agencies, professional bodies, and also clients for training of their employees (table 16.1). Similar inclination is also seen for some firms in 'Marketing' innovation type.

Table 16.1: Support accessed for different types of training and innovation types

Innovation	Inhouse	Govt Agency	R&D Instt	Professional Body	Supplier	Client
Prod	88.24	2.94	0.00	8.82	2.94	2.94
Process	93.55	6.45	0.00	4.84	1.61	3.23
Qlty	83.05	5.08	0.00	10.17	1.69	1.69
Input	80.00	15.00	0.00	15.00	5.00	10.00
Alt mat	73.33	6.67	0.00	6.67	0.00	0.00
New Mach	84.52	3.57	0.00	5.95	1.19	1.19
Mkt	84.91	5.66	0.00	11.32	1.89	1.89
Org	70.00	0.00	0.00	0.00	0.00	0.00

When examined in terms of size of firms (TO), the table 16.2 shows that small or tiny percentage of firms in different size categories that accessed external support for training of their employees preferred Professional bodies as the source. Some of the smaller firms also approached government agencies.

Table 16.2: Support accessed for different types of training and size of firms (TO)

TO in crores	Inhouse	Govt Agency	R&D Instt	Professional Body	Supplier	Client
Less than1	85.19	5.56	0.00	1.85	0.00	0.00
1 to less 5	88.24	0.00	0.00	0.00	0.00	0.00
5 to less 10	72.73	0.00	0.00	4.55	0.00	0.00
10 to less 20	82.35	5.88	0.00	0.00	0.00	0.00
20 to less 50	100.00	0.00	0.00	16.67	0.00	0.00
50 to less 100	100.00	0.00	0.00	11.11	11.11	11.11
100 & above	75.00	0.00	0.00	25.00	0.00	25.00

Interesting scenario emerges when firm size is seen in terms of manpower. Table 16.3 shows that smallest firm do not access any external support system for training, where as some percentage of firms in the larger sizes (150 – 200, and 200 and above), access professional bodies, supplier and clients for training. Firms in between the above two categories also depend on in-house expertise while only small percentage approaching government agencies.

Table 16.3: Support accessed for different types of training and size of firms (MP)

MP	Inhouse	Govt Agency	R&D Instt	Professional Body	Supplier	Client
< 10	70	0	0	0	0	0
10 to < 20	77.78	3.70	0.00	3.70	0.00	0.00
20 to < 50	92.68	2.44	0.00	7.32	0.00	0.00
50 to < 100	96.30	7.41	0.00	3.70	0.00	0.00
100 to < 150	90.00	0.00	0.00	0.00	0.00	0.00
150 to < 200	100.00	0.00	0.00	0.00	14.29	14.29
200 and above	87.50	0.00	0.00	12.50	0.00	0.00

Among the small percentage of firms that approach external support, when categorized in terms of their market reach, it is seen from table 16.4 that those without national or

international reach depend mostly on government agencies. Some firms with wider market reach approach professional bodies, supplier and clients.

Table 16.4: Support accessed for different types of training and market reach of firms

Market	Inhouse	Govt Agency	R&D Instt	Professional Body	Supplier	Client
Local	95.65	4.35	0.00	0.00	0.00	0.00
More than 3 states	55.56	11.11	0.00	0.00	0.00	0.00
National	93.88	0.00	0.00	6.12	0.00	0.00
International	84.00	4.00	0.00	12.00	4.00	4.00

Competition intensity and accessing external support for training do not show any pattern, except that some firms facing lowest competition intensity approach or use only government agencies for training of manpower (table 16.5). Some firms also use professional bodies. Over all incidence of accessing external agencies by firms facing higher intensity of competition is almost non-existent.

Table 16.5: Support accessed for different types of training and competition intensity

Competition Intensity	Inhouse	Govt Agency	R&D Instt	Professional Body	Supplier	Client
<10	20.00	20.00	0.00	0.00	0.00	0.00
10 to <20	78.95	5.26	0.00	15.79	0.00	0.00
20 to < 40	97.30	2.70	0.00	2.70	0.00	0.00
40 to < 60	84.00	0.00	0.00	0.00	4.00	4.00
60 to< 100	88.24	0.00	0.00	0.00	0.00	0.00
100 & above	85.00	5.00	0.00	5.00	0.00	5.00

How HR is nurtured: Chapter Summary and observations

Extent of Informatisation

Across innovation types on an average 68% firms claim to have MIS in place, highest is 87% for firms in "Alternative Material' innovation group. Most of the firms claim that the MIS connect all staffs. Also larger the firms size more firms have MIS. Only 39% firms in the smallest firm category claim having MIS. In case of largest firms, only about 50% firms connect all staffs; while in other groups of firm sizes, coverage is more widely spread.

In case of size of the firm in terms of MP there is no indication that larger firms are better adopters of MIS. Firms having wider market reach are more inclined towards ICT enabled MIS with separate departments. Smaller percentage of firms with narrower market reach have MIS. Another interesting observation regarding MIS is that higher the intensity of competition lower is the preference for MIS.

Decision Making

ANOVA results show that when one innovation type is seen vis-à-vis other innovation types, then all innovation types show significant relation between extent of centralization and types of innovation. In terms of TO irrespective of the size of the firms, decision making remains with the proprietors. However, for smaller firms there are cases, although for small percentage of firms, of involving other management staffs, clients, professional consultants, and govt departments. In cases of large firms proprietors are the sole decision maker. Similar scenario emerges when size of the firms is measured in terms of manpower.

Firms operating in the local market show proprietor level decision making. It is little less for firms with wider market reach. ANOVA results reject the null hypothesis to suggest that there is significant relationship between extent of centralization in decision making and market competition faced by the firms ($F = 23.64$; $Pr(>F) = 3.36e-06$).

Incentives to the employees

Most firms in all innovation types claim giving best salary in the industry and also financial awards on the basis of the performance. Fewer firms, however, claim offering stake in the company or stake in the innovation. Most of the firms claim providing non-financial incentives like training and new skill development, and also job security. Incentives like help for children education is rare.

Incentive structure does not show much variation among firms in different size groups (in terms of both TO and MP). Non-financial incentives have more occurances in cases of larger firms.

Financial incentives are more pronounced in cases where firms have wider market reach. This is also true for non-financial incentives, except for help in education. There is indication that firms with stronger hold on the market (lesser competition intensity) are better in providing financial and non-financial incentives to the employees.

Training of employees

For 30% of the firms training activities are non-existent. About 2% firms provided training to 40 to 60% of its employees. ANOVA suggests that there is significant relation between manpower trained and innovation types like 'Quality and Standard'; 'Input use'; and 'Marketing'. And it is not so in other types of innovations.

There is not much notable difference in employees' training activities over firms of different sizes (TO). It is interesting to observe that firms with larger manpower are least active in training their employees.

Firms having wider market reach are more active in training their employees. ANOVA result, however, does not support any such relation. There are indications that firms facing comparatively lower intensity of competition are more active in training their employees.

Support Accessed for training of manpower

Only a very small percentage of firms accessed external support for training their employees; and mostly depended on their in-house expertise. Smaller firms hardly access external support. A few small firms with only local market reach approach government agencies for training. Otherwise professional bodies are preferred sources.

Observation

Overall picture suggests a sleepy, uneventful atmosphere. Firms practice the same things that become industry survival norm. There is ICT enabled MIS for most of the firms, but decision making is centralised. Most of the firms claim the same extent and types of incentives; there is no industry leader as attractive employer. The industry in general does not provide career prospect, or skill development; most of them do not access the available training and skill development opportunities with external agencies. As such, from innovation perspective, the scenario is not encouraging for gains in productivity or growth.

C. **How is it used for gains from innovation Sourcing knowledge; External linkages; Assessing gains?**

How HR is used?

Summary Observation

Issues examined are firms' strategies for competition, technology initiatives and support accessed, constrained faced,

Strengthening technological capability is recognized by firms as the most important requirement for wining competition. Firm size has some bearing on technology initiatives. Larger firms are more inclined to approach National Laboratories for technological inputs. Firms with wider market reach and firms with lesser competitive pressure are more technology oriented, seeking technology inputs from supporting agencies. Private agencies are more frequently approached for technology related support. Government agencies are approached mostly for finance and consultancies. Inadequate response from technology support system, and problem in dealing with government departments are seen as major constraints.

This section draws focus on how HR is used for gains for the firms. The question is tricky in the sense that while operating in a competitive scenario, ability to survive following the market practices could be the gain. Wining the competition to become the market leader could be another type of gain. The latter is the typical dynamics of an innovative firm that continuously endeavor to own practices that are unique to the firm. This section therefore begins with the probe on firms' strategies to win

competition. Since technological innovation is our core focus, we elaborate the strategies with technological initiatives of the firms. Quality and Standard are the first technological initiative that a firm would take for foothold in the market. While we focus on quality and standard initiatives, we probe further to understand the extent of technology initiatives through their linkages with sources of technology.

Strategies to win competition

Strategies have been captured as firms' perception about need for strengthening different components of firms' activities, namely, technology, HR, marketing, workers' motivation, R&D, after sales service, and cost management. Tables 17.1 to 17.5 present firms responses for five attributes chosen.

Table 17.1 presents the responses classified by innovation types. Technology as strategy figures for 'New Machine', 'Process' and 'Quality/standard' types of innovations. Same set of firms also emphasizes on the needs for better product profile. Workers' motivation appears to be important part of strategy for about 34% firms engaged in 'New Machine' type of innovations. 48% firms under Marketing innovation consider strengthening technology as part of the strategy along with new product profile.

Table 17.1: Strategies to win competition and innovation types

Innovation	Tech	HR	MKT	Worker motive	R&D	After sales	Prod profile	Cost mgt
Prod	37	9	10	10	4	9	29	13
Process	63	10	17	32	12	11	47	20
Qlty	54	8	14	27	10	9	44	20
Input	16	5	7	11	7	6	15	11
Alt mat	15	2	2	7	3	1	10	8
New Mach	75	7	14	34	13	12	54	19
Mkt	48	8	13	21	8	9	39	14
Org	9	3	6	6	3	2	7	5

Firms, small and big in terms of TO, put emphasis on strengthening technology and product profile (table 17.2). Workers' motivation and cost management also figure as

part of the strategy needs, particularly with the large firms. Interestingly, smaller firms think they need strengthening R&D related activities.

Table 17.2: Strategies to win competition and size of firms (TO)

TO in crores	Tech	HR	MKT	Worker motive	R&D	After sales	Prod profile	Cost mgt
Less than1	94.44	9.26	7.41	33.33	7.41	9.26	70.37	16.67
1 to less 5	100.00	5.88	5.88	35.29	23.53	17.65	52.94	17.65
5 to less 10	95.45	22.73	27.27	18.18	45.45	13.64	72.73	27.27
10 to less 20	82.35	0.00	5.88	17.65	5.88	5.88	70.59	11.76
20 to less 50	83.33	0.00	16.67	16.67	0.00	0.00	66.67	0.00
50 to less 100	100.00	0.00	44.44	22.22	11.11	22.22	88.89	22.22
100 & above	100.00	0.00	75.00	75.00	0.00	75.00	100.00	75.00

When seen in terms of manpower, again technology and product profile appear as important components of the strategy. Cost management and workers' motivation also figure in cases of some firms of all sizes. Larger firms focus on marketing as well as R&D.

Table 17.3: Strategies to win competition and size of firms (MP)

MP	Tech	HR	MKT	Work motiv	R&D	After sales	Prod profile	Cost mgt
< 10	90.00	10.00	20.00	50.00	0.00	0.00	70.00	20.00
10 to < 20	96.30	7.41	0.00	25.93	7.41	7.41	7.41	77.78
20 to < 50	87.80	2.44	19.51	14.63	9.76	17.07	78.05	14.63
50 to < 100	96.30	14.81	7.41	37.04	14.81	7.41	62.96	22.22
100 to < 150	90.00	20.00	20.00	50.00	10.00	10.00	40.00	30.00
150 to < 200	100.00	0.00	42.86	71.43	14.29	28.57	57.14	0.00
200 and above	100.00	12.50	37.50	62.50	25.00	12.50	62.50	50.00

In terms of Market reach of the firms (table 17.4), it is interesting to note that firms that have achieved market reach beyond local market, but do not have reach at national and international market are more concerned about all the aspects of strategies for wining competition. These are the firms who want to strengthen HR, workers'

motivation, better product profile, and more efficient cost management. And all of them want to strengthen their technological ability.

Table 17.4: Strategies to win competition and market reach

Market	Tech	HR	MKT	Worker motive	R&D	After sales	Prod profile	Cost mgt
Local	100.00	6.52	8.70	30.43	4.35	6.52	67.39	13.04
More than 3 states	100.00	33.33	22.22	55.56	33.33	22.22	66.67	55.56
National	93.88	2.04	14.29	24.49	6.12	12.24	73.47	14.29
International	80.00	16.00	32.00	48.00	24.00	16.00	68.00	28.00

In addition to technology and product profile, which is common concern for firms facing different intensity of competition, workers' motivation appears to be more important for firms facing comparatively lesser competition (table 17.5).

Table 17.5: Strategies to win competition and competition intensity

Competition Intensity	Tech	HR	MKT	Worker motive	R&D	Tech inputs	After sales	Prod profile	Cost mgt
<10	100.00	0.00	20.00	60.00	0.00	0.00	0.00	60.00	20.00
10 to <20	73.68	21.05	21.05	31.58	15.79	5.26	21.05	73.68	21.05
20 to < 40	97.30	5.41	13.51	29.73	18.92	8.11	10.81	75.68	16.22
40 to < 60	100.00	12.00	28.00	40.00	12.00	8.00	16.00	52.00	20.00
60 to< 100	100.00	0.00	0.00	35.29	0.00	0.00	5.88	52.94	11.76
100 & above	95.00	10.00	15.00	35.00	5.00	10.00	10.00	70.00	35.00

Technology initiatives

In the above (tables 17.1 to17.5), most of the firms viewed technology upgrade and better product profile as the priorities. Following tables 18.1 to 18.5 examines firms' technology initiatives given their priorities. In the tables, column 'R&D' does not reflect R&D activities initiated by the firms. Very few firms actually initiated R&D as in-house activities. It reflects more on their realization of need for R&D. Some firms have approached different agencies like National Laboratories, universities, and collaborators. for technological help. Firms were quite candid about constraints

encountered in their technology initiatives. We capture both initiatives and constraints in the following tables.

Table 18.1a presents firms' responses on initiatives and table 18.1b on constraints encountered classified under innovation types. While most of the firms in all innovation types recognize the importance of R&D, many of them have approached National Laboratories for help or for technology inputs/consultancies. Firms approaching universities and collaborators is small in percentage but is not rare. Constraints have been captured as 'workers' motivation', 'Work Culture' with in the firm, 'Cost' of technology initiative, 'Support' from mainly different government agencies, Dealing with 'Govt. departments', and 'Union' creating hurdle. Lack of support from government agencies turn out to be most important constraint, followed by dealing with the government departments, and cost of technology initiative. While other factors are not rare, union activities never appeared as problems. Figures 18.1a and 18.1b present graphical view of the responses.

Table 18.1a: Technology initiatives and innovation types

Type	R&D	Nat lab	University	Collaborator
Prod	82.35	23.53	8.82	5.88
Process	83.87	12.90	4.84	1.61
Qlty	62.71	10.17	5.08	1.69
Input	85.00	20.00	5.00	5.00
Alt mat	80.00	13.33	13.33	6.67
New Mach	85.54	9.64	3.61	1.20
Mkt	83.02	9.43	3.77	1.89
Org	60.00	10.00	10.00	10.00

Table 18.1b: Constraints in technology initiatives and innovation types

Innovation type	Constraint					
	Motivation	Work culture	Cost	support	Govt dept	Union
Prod	11.76	11.76	23.53	64.71	29.41	0.00
Process	6.45	4.84	20.97	72.58	20.97	0.00
Qlty	6.78	8.47	28.81	69.49	42.37	1.69
Input	20.00	10.00	40.00	50.00	25.00	0.00
Alt mat	13.33	20.00	26.67	80.00	80.00	0.00
New Mach	7.23	6.02	22.89	74.70	32.53	1.20
Mkt	7.55	5.66	13.21	60.38	28.30	1.89
Org	20.00	10.00	20.00	50.00	20.00	0.00

Figure18.1a: Technology initiatives and innovation types

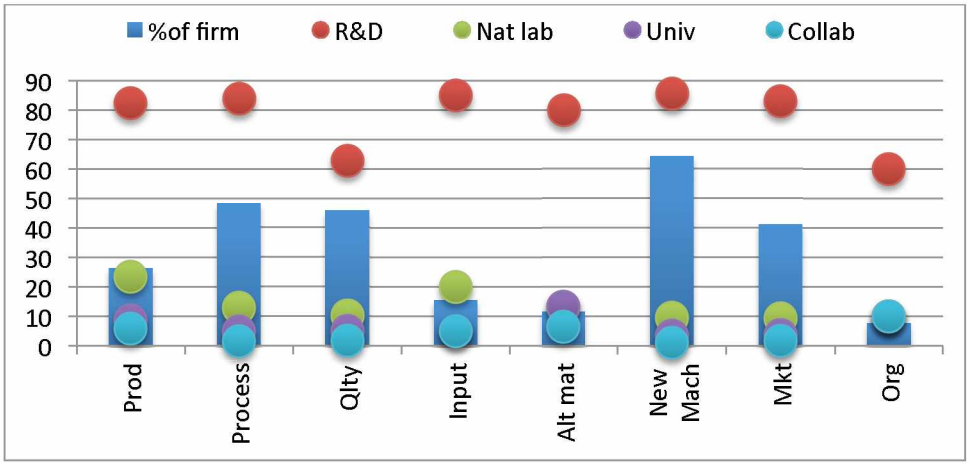
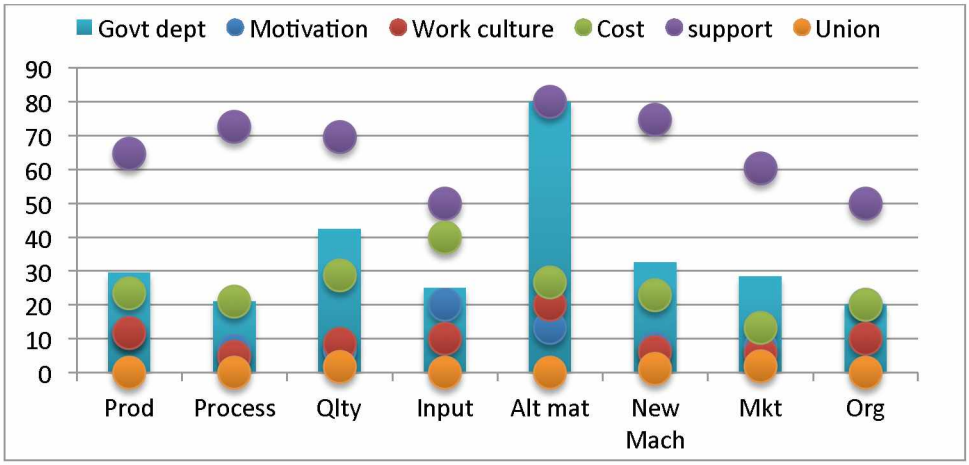


Figure 18.1b: Constraints in technology initiatives and innovation types



In terms of TO of the firms, smaller firms appear to be least enthusiastic of R&D and related initiatives; where as middle level firms and large firms are more active in approaching external agencies for technological inputs. Smaller firms face more constraints accessing support system, where as the general problem of dealing with govt. departments remain for firms from all size groups (table 18.2a and 18.2b).

Table 18.2a: Technology initiatives and firm size (TO)

TO in crores	R&D	Nat lab	University	Collaborator
Less than1	44.44	5.56	1.85	0.00
1 to less 5	82.35	11.76	0.00	0.00
5 to less 10	90.91	0.00	0.00	4.55
10 to less 20	82.35	5.88	0.00	0.00
20 to less 50	100.00	16.67	16.67	0.00
50 to less 100	77.78	0.00	0.00	0.00
100 & above	100.00	25.00	0.00	0.00

Table 18.2b: Constraints in technology initiatives and firm size (TO)

TO in crores	Motivation	Work culture	Cost	Support	Govt dept	Union
Less than1	3.70	0.00	20.37	81.48	22.22	0.00
1 to less 5	5.88	5.88	23.53	82.35	64.71	0.00
5 to less 10	0.00	9.09	9.09	72.73	18.18	0.00
10 to less 20	5.88	11.76	11.76	76.47	41.18	5.88
20 to less 50	0.00	0.00	33.33	83.33	33.33	0.00
50 to less 100	11.11	11.11	11.11	44.44	22.22	0.00
100 & above	25.00	0.00	50.00	25.00	50.00	0.00

Smaller firms (MP) are more inclined towards R&D but have not approached National laboratories, universities, or collaborators for technological inputs. Such initiatives appear to be mostly taken by large firms (MP). Cost of technology initiatives is main constraints for the smaller firms. Larger firms find support system as inadequate (tables 18.3a and 18.3b).

Table 18.3a: Technology initiatives and firm size (MP)

MP	R&D	Nat lab	University	Collaborator
< 10	90.00	0.00	0.00	10.00
10 to < 20	77.78	7.41	3.70	0.00
20 to < 50	75.61	4.88	2.44	0.00
50 to < 100	51.85	3.70	0.00	0.00
100 to < 150	70.00	0.00	0.00	0.00
150 to < 200	57.14	0.00	0.00	0.00
200 and above	87.50	12.50	0.00	0.00

Table 18.3b: Constraints in technology initiatives and firm size (MP)

MP	Motivation	Work culture	Cost	Support	Govt dept	Union
< 10	70.00	10.00	0.00	0.00	0.00	0.00
10 to < 20	3.70	7.41	77.78	33.33	0.00	0.00
20 to < 50	4.88	4.88	21.95	63.41	21.95	0.00
50 to < 100	7.41	3.70	22.22	88.89	29.63	3.70
100 to < 150	0.00	0.00	10.00	90.00	10.00	0.00
150 to < 200	14.29	0.00	28.57	71.43	28.57	0.00
200 and above	12.50	25.00	12.50	25.00	37.50	0.00

It is interesting to note in table 18.4a that some firms with only local market reach have approached National Laboratories. The general trend, however, is that wider the market reach more is the incidence of approaching technology agencies. While some firms complaint of work culture as constraint, inadequate support system and dealing with government departments, followed by cost of technology remain major constraints (table 18.4b)

Table 18.4a: Technology initiatives and market reach

Market	R&D	Nat lab	University	Collaborator
Local	30.43	2.17	0.00	0.00
More than 3 states	77.78	11.11	0.00	0.00
National	95.92	2.04	0.00	0.00
International	88.00	12.00	8.00	0.00

Figure 18.4b: Constraints in technology initiatives and market reach

Market	Motivation	Work culture	Cost	Support	Govt dept	Union
Local	2.17	0.00	15.22	78.26	10.87	2.17
More than 3 states	11.11	22.22	33.33	66.67	44.44	0.00
National	4.08	2.04	10.20	69.39	26.53	0.00
International	4.00	12.00	28.00	72.00	44.00	0.00

Firms facing lower intensity of competition, have less focus on R&D but more active approaching National Laboratories, and also universities for technological help (table 18.5a). The same enthusiasm is missing in cases of firms facing higher intensity of competition. These firms also complaint of inadequate responses from the technology support system and government departments. Such complaints, however, are common for firms facing higher intensity of competition (table 18.5b). Interestingly, complaints on union activities as constraints have come only from the group of firms with lower competition.

Table 18.5a: Technology initiatives and competition intensity

Crowd	R&D	Nat lab	University	Collaborator
<10	40.00	40.00	20.00	0.00
10 to <20	78.95	5.26	0.00	5.26
20 to < 40	78.38	2.70	0.00	0.00
40 to < 60	96.00	4.00	0.00	0.00
60 to< 100	41.18	0.00	0.00	0.00
100 & above	75.00	10.00	5.00	0.00

Figure 18.5b: Constraints in technology initiatives and competition intensity

Crowd	Motivation	Work culture	Cost	Support	Govt dept	Union
<10	0.00	0.00	60.00	60.00	80.00	20.00
10 to <20	10.53	10.53	36.84	63.16	52.63	0.00
20 to < 40	2.70	0.00	0.00	70.27	16.22	0.00
40 to < 60	8.00	8.00	28.00	92.00	24.00	0.00
60 to< 100	0.00	0.00	5.88	88.24	11.76	0.00
100 & above	5.00	10.00	20.00	75.00	25.00	0.00

Support Accessed

The above section has clear statement on inadequate responses of the support system to augment the technology initiatives of the firms. We have further probed the purpose for and sources of support accessed by the firms. Table 19 elaborates the purpose, namely, technology generation, diffusion, consultancy, tools and equipment, testing facilities, raw material, finance, infrastructure, training and skill development etc. On the sources of support we have used categories like, In-house, private agencies, government agencies, and foreign agencies. Information was collected on nature of linkages with agencies, as once, intermittent, and continuous. And we also tried to elicit information on their experience from linkages in a five point scale. It is evident from the table that most of the firms accessed support for raw material (94%), and tools and equipment (40%). Except for finance for which firms mainly depended on government agencies, for all other needs private agencies found to be more preferred. Government agencies, however, preferred for consultancy services. In many cases this could be because of mandatory requirements for finances from government agencies. Foreign agencies have been approached in cases of technology generation, diffusion, testing facilities and also for training and skill development. For consultancy, tools and equipment, testing facilities, and infrastructure, linkages are sometimes intermittent; otherwise such linkages are on continuous mode. Overall rating of such linkages is satisfactory, with 'best' ratings in cases of technology generation and testing facilities. There is no entries under 'useless' rating. Figures 19a, b, and c present graphical views of the table 19.

Table 19: Support accessed

Support for	% of Firm	Support from				Likages			Rating (1-best, 5-useless)			
		Inhouse	Pvt	Govt	Fgn	Onece	intermitant	Continuous	1	2	3	4
Generation	9	27	55	0	18	0	36	64	45	27	27	0
Diffusion	4	40	20	20	20	0	0	60	20	60	0	20
Consultancy	2	67	0	33	0	0	67	33	33	67	0	0
Tools etc	40	6	88	0	6	19	62	19	6	90	4	0
Facilities/testing	6	38	25	25	13	0	25	63	50	38	13	0
Raw Material etc	94	0	98	2	2	2	4	93	12	81	7	0
Finance	19	4	24	92	0	0	8	92	20	80	0	0
Infra	4	40	60	0	0	40	60	0	20	80	0	0
Trg and Skill	5	57	29	0	14	29	29	43	29	29	43	0

Figure 19 a: Support accessed

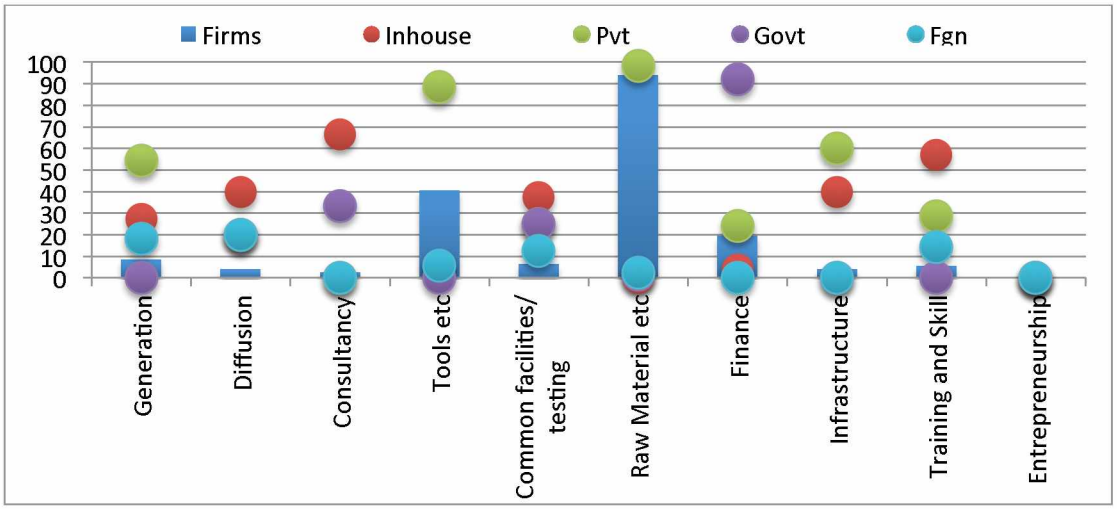


Figure 19b: Nature of Linkage

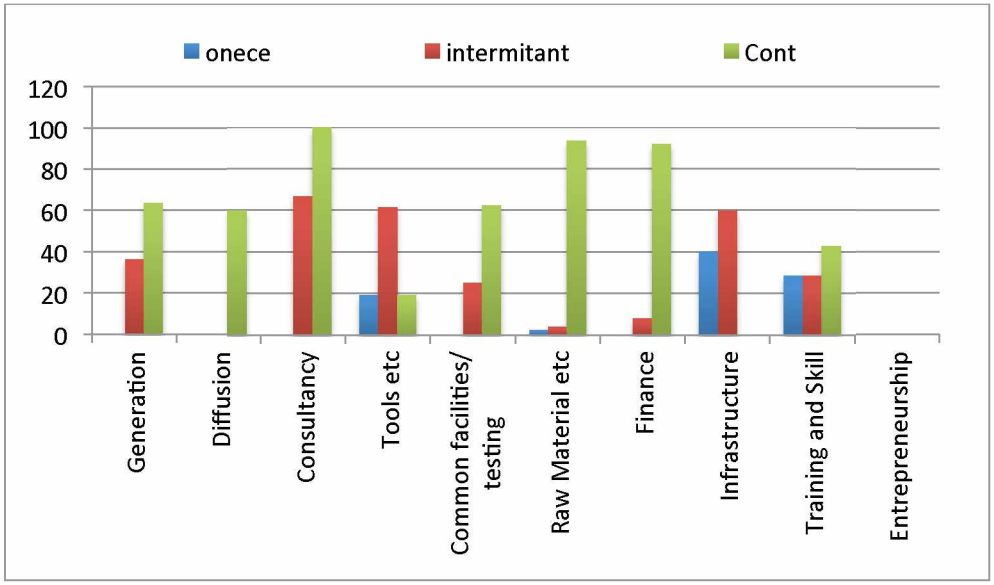
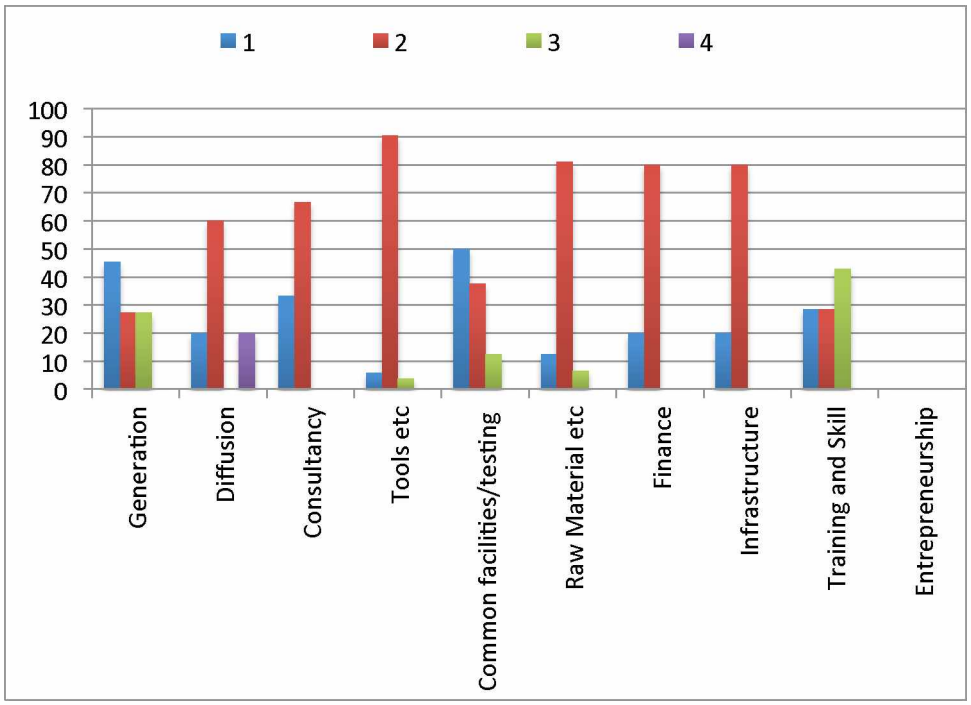


Figure 19c: Rating of linkages



How HR is used: Chapter summary and observation

Strategies to win competition

Technology as strategy figures for 'New Machine', 'Process' and 'Quality/standard' types of innovations. Same set of firms also emphasizes on the needs for better product profile. Workers' motivation appears to be important part of strategy for about 34% firms engaged in 'New Machine' type of innovations. 48% firms under marketing innovation consider strengthening technology as part of the strategy along with new product profile.

Firms, small and big in terms of TO, put emphasis on strengthening technology and product profile. Workers' motivation and cost management also figure as part of the strategy needs, particularly with the large firms. Interestingly, smaller firms think they need strengthening R&D related activities. When seen in terms of manpower, again technology and product profile appear as important components of the strategy. Cost management and workers' motivation also figure in cases of some firms of all sizes. Larger firms focus on marketing as well as R&D.

In terms of Market reach firms that have achieved market beyond local market, but do not have reach at national and international market are more concerned about all the aspects of strategies for wining competition. These are the firms who want to strengthen HR, workers' motivation, better product profile, and more efficient cost management. And all of them want to strengthen their technological ability.
In addition to technology and product profile, which is common concern for firms facing different intensity of competition, workers' motivation appears to be more important for firms facing comparatively lesser competition.

Technology initiatives

While most of the firms in all innovation types recognize the importance of R&D, many of them have approached National Laboratories for help or for technology inputs/consultancies. Firms approaching universities and collaborators is small in percentage but is not rare.

Lack of support from government agencies turn out to be most important constraint, followed by dealing with the government departments, and cost of technology initiative. While other factors are not rare, union activities never appeared as problems.

In terms of TO of the firms, smaller firms appear to be least enthusiastic of R&D and related initiatives; where as middle level firms and large firms are more active in approaching external agencies for technological inputs. Smaller firms face more constraints accessing support system, where as the general problem of dealing with govt. departments remain for firms from all size groups.

Smaller firms (MP) are more inclined towards R&D but have not approached National laboratories, universities, or collaborators for technological inputs. Such initiatives appear to be mostly taken by large firms (MP). Cost of technology initiatives is main constraints for the smaller firms.

Some firms with only local market reach have approached National Laboratories. The general trend, however, is that wider the market reach more is the incidence of approaching technology agencies. While some firms complaint of work culture as constraint, inadequate support system and dealing with government departments, followed by cost of technology remain major constraints.

Firms facing lower intensity of competition, have less focus on R&D but more active approaching National Laboratories, and also universities for technological help. The same enthusiasm is missing in cases of firms facing higher intensity of competition. These firms also complaint of inadequate responses from the technology support system and government departments. Such complaints, however, are common for firms facing higher intensity of competition. Interestingly, complaints on union activities as constraints have come only from the group of firms with lower competition.

Support Accessed

Most of the firms accessed support for raw material (94%), and tools and equipment (40%). Except for finance for which firms mainly depended on government agencies, for all other needs private agencies found to be more preferred. Government agencies,

however, preferred for consultancy services. In many cases this could be because of mandatory requirements for finances from government agencies. Foreign agencies have been approached in cases of technology generation, diffusion, testing facilities and also for training and skill development. For consultancy, tools and equipment, testing facilities, and infrastructure, linkages are sometimes intermittent; otherwise such linkages are on continuous mode. Overall rating of such linkages is satisfactory, with 'best' ratings in cases of technology generation and testing facilities. There are no entries under 'useless' rating.

Observation

Strengthening technological capability is recognized by firms as the most important requirement for wining competition. Firm size has some bearing on technology initiatives. Larger firms are more inclined to approach National Laboratories for technological inputs. Firms with wider market reach and firms with lesser competitive pressure are more technology oriented, seeking technology inputs from supporting agencies. Private agencies are more frequently approached for technology related support. Government agencies are approached mostly for finance and consultancies. Inadequate response from technology support system, and problem in dealing with government departments are seen as major constraints.

Summary and Observation

Theoretical backdrop

DST study on NIS reveals, among other things, the 'disconnect' between the innovation support system and the production system indicating inadequate demand for supports to innovation. It also suggests that overall innovation scenario is predominantly 'new to the firm' in the form of adopting new machines. This necessitates a close look inside the firms.

Within the NIS approach to innovation reasonably large body of literature has been published on National and sectoral systems of innovation. The NIS, however, does not offer a micro theory of innovation. In the present study we try to probe Firm level Innovation System; or Innovation System Internal to Firm; examine the determinants of the innovation ability of the firms.

The theoretical understanding for the study is borrowed from the literature spanning from Adam Smith to Gary Becker focusing on the human capital of the firms as the source of productivity gains through application of scientific and technological knowledge through human resources who know how to use them. Therefore, Economists regard expenditures on education, training, medical care, and so on as investments in human capital. It is human capital that makes innovation happen.

While human capital as determinant for firm level innovation has been largely ignored, a few available studies focus mainly on firms in developed countries suggesting a positive relation between innovation and level of education of the employees and training provided/arranged by firms. A few studies examined the same relations in case of developing countries with mixed results.

In the context of the present study we shall like to postulate that from Adam Smith to Gary Becker, human capital has indisputably evolved as the key factor for economic growth of a nation. There is no reason to believe that it is not so at micro level production system involving firms. The issue, therefore, is not how far the relationship is valid in the context of different economies, but to probe the firm level practices for

creating firm specific human capital, and assess the implication of the same on technology and innovation orientation of firms.

The present study on Human Resource aspects of innovative firms in Indian industries is designed broadly following the above understanding. A literature search has resulted about 63 studies (covering literature from 1980 to 2014) on Human Resource issues in Indian industries that we found somewhat relevant in the context of our studies. Most of them are from managerial guidelines, and do not concern the innovation aspects. Broadly these studies suggest skill shortage, absence of specialised training, skill shortage, talent development, career opportunities, attrition of manpower as weak areas that need special attention for sustainable productivity gains, especially in the SME sector. These issues, however, never examined from the perspective of firms' growth and technology strategies.

The contributions of the present study, therefore, are four folds: It is more comprehensive, it reorients the study on firm level innovation from verification of determinants to activation of the determinants, and in that it brings into focus three aspects: How the employees are organized, how are they motivated to give their best – incentivisation, and how the alienation is allayed through employees' participation in decision making. A questionnaire was developed accordingly to focus on this critical aspect, along with the perennial weaknesses indicated by the available studies.

Data and Methodology

The study is based on a questionnaire based survey of 129 firms chosen from the innovative firms identified in the National Innovation Survey from seven states, namely, Karnataka and Maharashtra (high innovation), Delhi and West Bengal (Medium innovation) Tripura and Bihar (low innovation), and Gujarat as a special case.

Firms in the Study

We have examined the question in terms of five attributes, namely, Types of Innovation (TOI), Size in terms of Turn Over (TO), Size in terms of Manpower (MP),

Market reach of the firms (MktR), and Competition Intensity (CI) faced by a firm. The study claims novelty in inclusion of the last two attributes to capture the essence of Schumeterian theory of technological innovation.

- Broadly, about 65% firms claim innovation in 'New Machine' type, followed by 'Process' innovation (48%) and 'Quality and Standard (45%).
- Size of the firms in terms of TO shows that about 43% firms have less than Rs. 1 crore as TO, and 73% fall under less than Rs. 10 crore category.
- When classified in terms of manpower (MP), about 68% firms have less than 60 Manpower, but about 20% firms have more than 100 manpower.
- Market reach of the firms with only local reach (36%) and firms with national market reach (38%) have more or less same presence in the study. 19% firm has claimed having reach in the international market.
- About 53% firms operate in a market with 20 to 60 competitors; and about 29% firms have competition with more than 100 firms. We, therefore, are dealing with firms not having any substantial market domination.

We have examined three broad questions:

A. How is the Human resource endowment of the firms is organised
B. How is it nurtured
C. How is it used for gains from innovation

A. How is the Human resource endowment of the firms is organised

The focus is on how human resources are organized within the firms being studied. We look at the human resource endowment of firms, technical and non-technical manpower, how they are deployed over departments, addition, and attrition of manpower.

Endowment and deployment of HR

90% firms do not have any innovation department, 85% do not have any R&D division. In case of 43% firms more than 60% workforce is deployed in the shop floor.

This is indicative of the fact that maintaining production capacity is the main function and concern of the firms; typical of firms operating in a competitive market condition, where firms survive by adopting practices that are in vogue in the market. This is consistent with the findings from NIS, which shows 'New Machines' as major mode of innovation coupled with innovations that are new to firm.

Share of technical manpower

- 35% firms do not have any technical manpower even in the production units. However, about 19% firms have 80% technical manpower in the production units.
- Firms claiming Product innovations show higher share of technical manpower, followed by firms in Process innovations, and New Machine types.
- Firms having more than Rs. 50 Crore TO showed higher share of technical Manpower in Innovation and R&D. Number of manpower (employees) as size of the firm also shows some upward trend in the share of the technical manpower in R&D and Innovation with larger size of the firms.
- Shares of technical manpower show upward trend for the firms having international market reach for HR, R&D and Innovation departments. For rest of the departments, however, trend is downward for firms having international market reach. It is somewhat indicative of the higher technological strength needed to reach international market.
- Share of technical manpower decreases in all departments for firms competing with number of competitors beyond 20.

There is indication that firms involved in product and process innovation are more inclined to employ skilled manpower. Also demand for skill increases with higher size, and wider market reach of the firms. It is also indicative of the fact that adequate impetus to growth and availability of skilled manpower coupled with wider market reach can make SMEs more innovation oriented.

Mobility of Manpower

- Mobility of manpower in terms of numbers added and number of attrition does not show much movement of technical manpower. It is even less in the case of non-technical manpower. The scenario does not change much when examined in terms of innovation types.
- In terms of size of the firm (TO) larger firms show more addition and attrition compared to smaller firms for both technical and non-technical manpower. Similar is the trend when size is measured with MP.
- There is addition of technical manpower in cases of firms with local and international market reach.
- There is almost no mobility of the non-technical manpower when examined with competition intensity. In the technical category, there is mobility more or less in similar proportions between addition and attrition.

A few studies that are available on Human Resource issues in Indian SMEs also indicate the lack of mobility of manpower. In effect it indicates the lack of technology related activities in Indian industries. As we shall see that the same is reflected in technology initiatives of the firms, and also in skill development through training of manpower.

B. Nurturing Human Resources

We examine the extent of Informatisatin; role of the employees in Decision Making; Incentives and Facilities; Training and Skill development.

Extent of Informatisation

Flow of information within the firm is an important way of involving the workforces in the activities of the firm with a sense of belonging. We have examined the extent in terms of ICT enabled MIS. Most of the firms claim ICT enabled MIS in place with MIS as separate departments and inclusive of all employees. In percentage terms Firms are more or less equally distributed over different types of innovation. However, in terms of size (TO as well as MP) a positive relationship between size and

informatisation is visible. The same positive relation is visible in case of market reach. It is interesting to note that there is indication of a negative relationship between intensity of competition and informatisation. A NASCOM study on ICT application in Indian SMEs, however, suggested that having ICT might not be seen as application of ICT for management. Our survey also has confirmation towards this through conversations with respondents.

Role in decision making

Proprietor or owner of the firm is the sole decision maker in overwhelmingly large number of cases; and it is the same for all five attributes. This is also reflected in some of the available studies on Indian industries. Although most of the firms claimed that MIS includes most of the departments and staffs, involvement in decision making is not inclusive.

Incentives

Incentives towards employees have been studied in terms of Salary, Help in children Education, Health facilities, Job Security, Stake in the Company, Role in Decision making, Training opportunities, New Skill Development, Career Prospect, Financial Reward, Stake in the gains from innovation. Most of the firms, across the five attributes claim matching the industry practices. Children Education as incentive is less practiced than other forms of incentives. Some upward variations are noticed in New Skill, Training, and Financial rewards for larger firms and firms with wider market reach.

We have further probed the training programmes elaborating on departments getting benefit of training and also where are they trained. About 30 % firms do not provide any training to their employees. Production division has largest share of trained manpower, followed by administration and marketing departments. Irrespective of departments, trainings are mostly inhouse, and in case of minor percentage of firms, it is with govt. agencies; and the picture does not change across the attributes.

The overall picture that emerges is that all the firms claiming the same extent and types of incentives, there is no industry leader as attractive employer. The industry in general does not provide career prospect, or skill development; most of them do not access the available training and skill development opportunities. As such, from innovation perspective, the scenario is not encouraging for gains in productivity or growth.

C. How is HR used for gains from innovation

We have investigated the technology related strategies of the firms and implications on Human Resources. Issues investigated are: Firms' strategies for growth and wining competition; the kind of support requirement envisaged and sources; sources of information/knowledge; linkages for technology initiatives; and constraints encountered.

Strategy to win over competition

Technology upgrade and workers' motivation followed by better cost management appear to be most important components of the strategy to win the competition. While this is true across the five attributes, it is more pronounced in the case of larger firms and also for the firms with wider market reach.

Support envisaged and sources

For technology related supports, namely, new technology, New tools, Testing facilities, Consultancy, raw material, etc. firms depend mainly on private agencies. Government agencies are mostly approached for finances and consultancies. There are cases of approaching foreign agencies for technology and testing facilities. Linkages with the support agencies are mostly continuous, except in the cases of consultancy and testing services.

Technology Initiatives and sources

As for technology initiatives most of the firms consider R&D as important and in this regard, national Laboratories are considered as important source by about 20% of

firms, followed by Universities and collaborators by smaller percentage. Industry Associations, Supplier and Vendors and Client companies are the main sources of information/knowledge for fairly good percentage of firms.

Constraints

Lack of institutional support is considered as the most important constraints for innovation, followed by cost of innovation. Liaison with government has been seen as important deterrent towards innovation. It is interesting to note that workers' union does not figure at all as any constraint to growth.

Policy and Action

The study does not present a very encouraging state of affairs for Indian manufacturing sector. Gaining grounds would require going back to the policy drawing board. The state of affairs of the innovation in the manufacturing sector (SMEs in particular) requires to be seen in terms of the future and emerging global scenario. In an increasingly globalised industrial activities, and fierce cost and technological competition from emerging economies like China, the road ahead is to infuse new products, improved products, new technologies and new skill sets.

Need of the time

There is a need to create policy incentives for the firm to grow bigger; the most important impetus for innovation. At present the policies are biased towards remaining small. The fear is that the bigger units will eat up the smaller ones. The policy is short sighted. It presumes the present industrial activities, the basket of products manufactured as the universe and unchangeable. In reality the globalised industrial dynamics offer a potential product basket that is infinitely expandable with new products.

Issues to be addressed

The study indicates what the production sector suffers from. Indian manufacturing sector, particularly the SMEs are in an interesting and intriguing crossroad. We have

tremendous technological achievements in the high tech areas along with a large pull of scientific and technological manpower that apparently is one of the major attractions for MNCs towards India, on the other side the production system suffers from practices that are archaic and far away from utilising the available scientific and technological knowledge pull. Becker in his seminal work 'Human Capital' argues that increasing reliance of industries on scientific and technological knowledge greatly enhances the value of education, technical schooling, on-the-job training, and other human capital. At the same time Becker writes, 'New technological advances clearly are of little value to countries that have very few skilled workers who know how to use them.'

Imperative

It is, therefore, imperative that the manufacturing sectors require help to gear up with new product ideas, new technologies and required skill sets, strong networking with technology generating system, harnessing human capital for creating innovation dynamics inside the firm.

Rejuvenating the Support System

As has been revealed in the NIS study, the existing organisational arrangements are created to provide support to wide spectrum of innovation needs. At the same time the study indicates the fact that such support system becomes rare as we move from the national level to the region/district levels, and therefore becomes ineffective, as it is reflected in the disconnect between the innovation support system and the production system.

DICs as Industry Commons

The new initiatives like 'Make in India', 'Skill India', and 'Start up India', have renewed the thrust towards strengthening innovation support system at the regions. The same, however, may fizzle out in the absence of a suitable organisational set up that can consolidate the need of new product ideas, new technologies and new skill sets for the generally defeatist manufacturing sector.

District Industry Centres (DICs) can be considered to be revitalised with a new mandate to undertake such tasks at regional/district level. DICs can be transformed to function as 'Industrial Commons', as hub of new product, technology, and skill. DICs can be seen in network with the technical institutions around it for accessing the available expertise. This would require a blue print for organisational transformation of DICs.

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