Chapter VII

Conclusion

7.1 SUMMARY OF FINDINGS

At global level, technology throughout has been the main driver of the automobile industry's growth. Firms' survival and growth in the given context are basically decided by their success in coping with 'change', technological change in particular.

Technological advances – both at firm and at industry levels – occur from R & D efforts of firms. Given that, R & D initiatives for producing meaningful outcome have to be based upon a minimum threshold level of investment and that such investments are often beyond the reach or capacity of an average firm in a developing country, control over technology remains highly skewed in favour of the developed country firms. The few developed country (DC) based giant automotive firms have naturally been the sources of most of the recent technological innovations in the industry.

A vicious circle of dominance and subordination thus perpetuates itself within the global automotive industry-structure. The DC based automotive firms with global operations and gigantic turnover invest huge sums in R & D that enable these firms to make technological breakthroughs; the technological mileage that so accrues to these firms is then profitably utilized by them for gaining competitive edge and hence for further consolidating their grip over
the global market of automobiles. Within this core-periphery framework, the developing country firms are often left with no alternative other than to becoming at best the 'trusted' collaborators (with clearly demarcated sales territories) or, worse still, the local assembling and selling agents of the DC-based firms.

Given that, in automotive industry, the control over technology remains highly skewed in favour of the developed country firms and that the manufacturing firms in developing country are often left with no alternative other than to depend continually on the DC-based firms for coping with technological advances, few pertinent questions come up:

- Can a firm based in a developing country, given its limited turnover and financial capability, come out of this vicious cycle of its dominance and continued subordination by developed country firms?

- To put it differently, can a firm in a developing country, which gains a foothold in the market by initially posing as a collaborator, build up in due course adequate strength so as to be able to effectively and independently cope with industry-level technological changes? To make such transformation possible, what technology-strategy should a developing country-based firm ideally follow? And,

- Whether a firm’s strategic focus on technological self-reliance, particularly in the context of a developing
country, would have any impact on its bottom line or corporate growth?

The above research questions were taken as the starting point of the present enquiry.

Given the complexity of the issues involved, for seeking an answer to the above questions at least three preconditions were to be duly fulfilled:

i. First, it was necessary to identify a firm in a developing country setting (preferably in India) which commanded a respectable height not only in terms of its record of growth and current market share but also in terms of its strategic location vis-à-vis the questions raised (informed choice of critical case).

ii. Second, the case was to be intensively studied over time to see how changes were being introduced in automotive industry periodically by technological breakthroughs and how the firm in question was responding to these technological changes at different points of time (longitudinal study).

iii. Third, while studying the case, qualitative information were as important as the quantitative data which were to be collected from multiple sources for making a meaningful assessment of the
strategic aspects and thereby generating a testable set of hypotheses vis-à-vis the research questions.

The complexity of the issues thus made it mandatory for us to adopt the case study method of research.

Based on an initial quick survey of the automotive industry scenario in India, an informed choice of Tata Motors Ltd. was made for the purpose of the case study.

The research questions were then translated into the following case-specific objectives:

i. To examine how Tata Motors (India) Ltd. being a developing country based automotive firm had been responding to the technological changes occurring in the industry at the global level.

ii. To identify from the specific patterns of Tata Motor's responses the major features of the firm's technology management strategy; and

iii. To finally assess whether the chosen technology management strategy in the context of Tata Motors (India) Ltd. had any bearing on overall corporate growth.

1991 was selected as the base year for the survey. Although initially it was our plan to limit the study period to 2004, in order to duly accommodate the contemporary trends, the terminal year, wherever feasible, was extended even up to 2008-09 depending on the availability of relevant data.
Chapter II delineated the conceptual framework of the enquiry. Based on a detailed survey of the relevant literature, the chapter tried to identify the crucial linkages that determine the pace and pattern of technological development at the industry and at firm levels and the implication of these linkages for overall corporate growth.

Chapter III situated the case in its historical context. The chapter presented a brief profile of the Tata Motors (India) Ltd. Indeed, the chapter III tried to establish the rationale for making an informed choice of Tata Motors (India) Ltd. as the case to be studied. The chapter showed that Tata Motors (India) Ltd. - which started and operated for more than half a century as a firm in a developing country setting - commanded a respectable height not only in terms of its record of growth and present global market-ranking but also in terms of its strategic location vis-à-vis the particular research questions formulated for the study.

Chapter IV examined the pattern of responses of Tata Motors (India) Ltd. to the technological changes occurring in the automotive industry at the global level. Longitudinal analysis covering the study period showed that the response pattern had throughout been proactive.

The proactive response of Tata Motors was borne out by its

- success in progressively reducing the time lag in launching of new products,
- progressively greater reliance on in-house R & D rather than on foreign sources of supply for acquiring new product/process technology,
• growing ability to un-bundle technology-package and restrict acquisition from external sources to only few crucial constituents of the package,

• near-total indigenization of product parts and components,

• the progressively higher number of Patents registered against its name, and

• as shown in detail in chapter V, the successful launching of a series of indigenously developed and designed commercial vehicle and passenger cars.

Chapter V, by analyzing Tata Motor’s research and development initiatives and also the R & D outcomes, delineated the salient features of Tata Motors’ technology management strategy.

Clearly, the technology management strategy of Tata Motors had throughout been guided by the premise that no firm in the world would ever part with a state-of-the-art technology which was the source of its own competitive advantage; hence, developing in-house capabilities in technology would be the sine-qua-non for ensuring corporate survival and growth. At least three important aspects of Tata Motors’ technology management strategy could be identified:

1. Focus on building in-house technological capabilities,

2. Steady advance in the direction of attaining globally comparable levels of R & D intensity,

3. Planned sequencing of phases for developing technological competence
Within Tata Motors' strategy of building technological competence, we could discern three clear phases:

In the first phase, Tata Motors focus was on building the necessary competence so that the company can effectively adapt and absorb the technologies that were being acquired from foreign auto-manufacturers.

In the second phase, Tata Motors started utilizing its capabilities for unbundling the technology packs and then relying primarily on in-house R & D for developing separately each constituent of the technology-pack in question. In this phase, while it was still necessary to depend on foreign sources for acquiring the technology pertaining to some constituents of the technology pack in question, Tata Motors used to acquire this technology directly from the machine tool manufacturers. That means, in this phase there was no longer the need to look for any foreign auto-manufacturer for outright purchase of the entire technology package.

In the third phase, which started relatively recently, Tata Motors has been striving to place itself along the technological frontier by focusing on cutting edge technology and 'first' innovations.

While the evolution of Tata Motors' technology management strategy, as delineated above, can be traced to a great extent to its corporate vision and forward looking management, the planned sequencing of the three phases is surely indicative of the proactive response of Tata Motors' management to the challenges and opportunities unleashed by the forces of globalization during the period following 1991. It is
worthwhile to note that during this period Tata Motors decided to
全球化 its operation and hence was increasingly under pressure to
gain competitive edge in the global market by focusing on in-house
technological competence.

Chapter VI made an attempt to quantitatively assess whether the
technology management strategy of Tata Motors had any bearing on
the company’s overall growth.

In order to measure the impact of Tata Motors’ technology
management on specific aspects of its corporate operation and growth,
the R&D Expenditure of Tata Motors during the period under
consideration was taken as the ‘representative’ of its technology
management strategy. Company’s annual sales, exports per year, net
worth per share & market capitalization were taken as indicators of
corporate growth.

Correlation coefficient was first calculated to know the degree of
relationship or association between (i) R&D expenditure and Tata
Motors Sales, (ii) R&D expenditure and Tata Motors export, (iii) R&D
expenditure and Net Worth per share, and (iv) R&D expenditure and
Tata Motors’ Market Capitalization. Correlation results indicated that
in that in the first three cases the relations between variables were
significant and positive. It was also found that R&D expenditure was
having only partial association with the Market Capitalization. The
reason for this might have been that apart from the internal variables
(like sales, profitability or competitive edge via R & D etc.) external
variables (like the general price trends and volatility in the stock
markets) also have decisive impact on market capitalization.
From Regression Analysis, it was found that Research and Development expenditure is having a significant impact on the company's sales, export and net worth per share and partially significant impact on the market capitalization.

Thus statistical analysis carried out in the Chapter VI indicated that the technology management strategy of Tata Motors had a positive and significant impact on such crucial aspects of the company's growth as annual sales, exports and net worth per share.

The case of Tata Motors (India) Ltd. showed how a firm based in a developing country was induced by its macro environment - featured by deregulation and progressive opening of external sectors - to adopt an aggressive stance as regards globalization of its operation. This stance in turn created compulsions for the firm to focus on development of in-house R & D capabilities and for attaining R & D intensity comparable to the global level. This aggressive and proactive stance ultimately created conditions for the firm to product-development programmes based on in-house capabilities and proceed forward independently for coping with technological change.

The three sine-qua-nons that empowered Tata Motors to take up the challenge and enabled the company to make things happen as they did were:

- A visionary management;
- A proactive technology management strategy, and
- A compelling/supportive macro environment.
7.2 SUGGESTIONS FOR FUTURE RESEARCH

Being a case study, our endeavour does not permit us to conclude with any broad generalization. Indeed our focus right from the beginning was on the exploration of many possible linkages. The study accordingly makes the following recommendations for future research:

1. The study points to the possibility of a strong positive correlation between a firm’s R & D expenditure level and its long term growth. This correlation needs to be tested by taking up a large sample of firms from the different segments of the manufacturing sector in India.

2. In case of Tata Motors we observed how a firm’s exposure to higher levels of competition creates compulsion for it to place focus on building technological capabilities as a potential source of competitive advantage. Does it happen in all cases? There is a need to examine the impact of competition on technology strategies of firms by taking up industry-level studies where several firms would be simultaneously covered.

3. Finally, the role that corporate vision plays in dictating and shaping a firm’s strategic stance within a given competitive setting also needs to be examined by means of a cross sectional study.

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