RESEARCH AND DEVELOPMENT IN LARGE SOFTWARE COMPANIES AND MULTIPLE ORIENTATIONS - A CASE STUDY OF INFOSYS

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ABSTRACT

Purpose : The role of Research and Development in the Software sector is inevitable. Also the long term competitive advantage and the survival of the software companies is dependent on the Research and Development activities and the innovations they are going to bring. But at the same time R & D is confined mainly to 'adaptive' area of multiple orientations .There should be R& Ds in other orientations also. Also the generative and adaptive and other strategic learning should combine to transform the organization into a fully reactive and thriving entity. So the purpose of the paper is to analyze the R &D's effectiveness on the gross profit of the company and linkage of the R & D initiatives with the creation of innovations and creation of new knowledge and integration of new knowledge.

Design/Methodology/Approach : This is based on the exploratory case study of Infosys R & D expenditure and knowledge management and comparing it with the new initiatives in the knowledge management in the IT industry.

Findings : The R & D activities do not have bigger impact on the return of the organization. Multiple Orientations are lacking in Infosys. The definition of R & D is not connoting innovativeness or entrepreneurship.

Research Limitations and Implications

Practical Implications : The survival of the IT companies is very much dependent on the multiple orientations and knowledge management.

Originality/value : The scope of R & D was confined before to technology, but now under multiple orientations assumes a new dimension and it's a combination of R & D in different orientations.

Keywords: Multiple Orientations, Innovation, Knowledge Management

LITERATURE REVIEW

In the modern strategic management the existence and competitive advantage of a company is based on the multiple orientations rather than a single orientation. The multiple orientations can be market, customer, entrepreneurial, technological etc. (Schindehutte, 2008)

Pearson (1993) has already proved that a firm concentrating in one orientation will not be successful in the long run. But usually the Research and Development activities of a firm is concentrated around the new Software development according to the changing needs of the market. But there is no Research and Development activities in those multiple orientations and the integration of those knowledge into one. This can produce a bigger impact on the performance of the software industries. Different studies have been done in the

area of the combinations of these multiple orientations. Some researchers are of the opinion that risk taking factor of entrepreneurial orientation is against the performance of the software companies. Covin and Slevin (1989) and Li et al (2008) have proved accordingly.

Organizational learning and Entrepreneurship: The role of the organizational learning in the survival of an organization is indispensable. Actually organizational learning is a byproduct of the entrepreneurial activity in an organisation. Wang (2008), Slater & Narver (1995) states that entrepreneurship and the learning of a company are directly related.

Also the learning of a company can be differentiated on the basis of the aim of the learning. Different orientations create different type of learning. Market orientation creates the 'adaptive learning'. This learning is for the survival of the organization. Whereas, the generative learning is created by the 'learning for the learning sake 'within an organization (Baker & Sinkula, 1999).

According to the opinion of Tiwana (2003) the global IT companies have to integrate their knowledge into an interactive whole to exist in a competitive environment. Also due to the knowledge explosion, the companies have to create new knowledge from time to time (Mathaissen & Pourkomeylian, 2003).

Also as new knowledge proliferates it is hard for companies to exist without producing new knowledge and manage themselves without the proper scientific knowledge management (Conner & Prahlad, 1996). So, a new kind of learning is required to manage knowledge and to combine the different learning in relation to different multiple orientations. According to the Infosys website the R and D services are working in two major areas :

1) Machine to Machine services
2) Mobile Infrastructure services

IT HELPS THEM

1) To increase their profitability.
2) Predictability in the market
3) Ability to innovate
4) Improving the products quality
5) Helps Differentiation (infosys.com)

The impact of the Research and Development on the profitability of the companies is arbitrary. But the method to measure the impact of the Research and development on the profitability is the Return on Research Capital (investopedia.com).

Silvola, H (2006) states in his research that there is no significant difference in the capital budgeting process employed by the small software companies and the large software companies. Also the formal sources of capital are used for the strategic investment in high tech companies. The R & D intensity, the size of the software industries etc. do not affect the methods used for the measurement of the cost of the capital.

It was found that cross border acquisitions will help in the innovation of the organization .Also it will also provide greater profits for the organization to invest in the R & D activities and innovation (Kobrin, 1991).

Also it can be also based on the strategic orientations of the organisation. In some organizations like organizations in Korea the executives give importance to the growth more than the returns whereas the US executives give more importance to the returns more than the growth. Also the type of strategic orientation may not be helpful to the company if they did not choose it consciously. The Daewoo Motors preferred growth whereas the General Motors preferred the returns and it proved disastrous to both of them (Hitt et al, 1997). It is not assured that spending for R & D will always bring success. The return on the investment is also not a justification for spending on R & D. There are other factors which are affecting it like the product life cycle. Also an investment of around 50 % of the revenue is advisable for this. Also sufficient care should be taken to the definitions given to the R & D expenditure. Some define it just as the amount spent by the engineering department without even considering whether it is used for developing a new product or not or whether it is used for producing some innovations. So R & D Effectiveness Index is

introduced to measure the effectiveness of R & D expenditure instead of the R& D expense as a percentage of the revenue return based on the next year.

R & D Effectiveness Index= % of new product revenue*(net profit %+ R & D %) (Mc Grath & Romeri, 1994)

METHODOLOGY

The methodology is the case study method in the light of the R & D expenditures of the Infosys. This is an exploratory case study method which will shed a light on the method of functioning of R & Ds in the organization. This is based on the grounded theory which employs crossed comparison method. Also the trend in the R & D expenditure is found out by the annual reports of Infosys. Also it is analyzed on the basis of the knowledge management theories to understand the multiple orientations existent in the Infosys. A comparison is also done on the basis of R & D expenditure of other IT companies. Also the future of multiple orientations in the company is predicted on the recent trends in the IT industry.

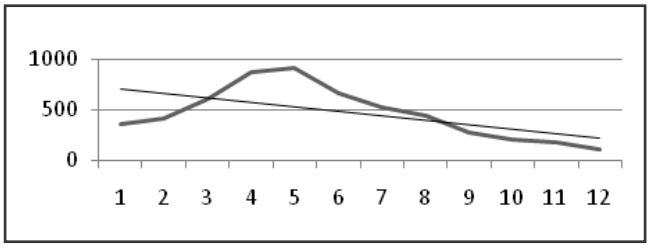
FINDINGS

$$\text{RORC} = \frac{\text{Current Year's Gross profit}}{\text{Previous Years R and D Expenditure}}$$

Table 1 : Infosys Profit and R & D Expenditure

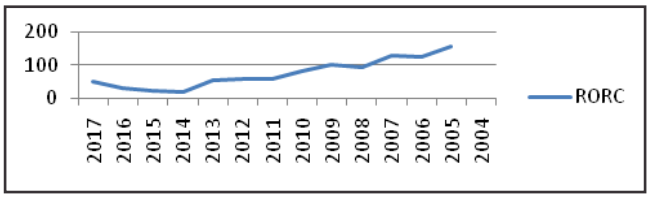
GROSS PROFIT		R & D expenditure			
		Revenue	Capital	Total	RORC
2017	18938	351	...	351	49.31771
2016	17600	384	31	415	29.09091
2015	19472	590	15	605	22.3047
2014	17603	873	.....	873	19.28039
2013	36765	907	6	913	55.70455
2012	31254	655	5	660	59.3055
2011	25385	521	6	527	57.69318
2010	21140	437	3	440	79.17603
2009	20264	236	31	267	100.8159
2008	15648	201	.....	201	93.7006
2007	13149	167	.....	167	128.9118
2006	9028	102	.....	102	122
2005	6860	74	.....	74	154.0189
2004	4761	43.06	1.48	44.54	

Figure 1 : R & D Expenditure



Source : Table 1

Figure 2 : RORC of Infosys



Source : Table 1

According to the Nasscom Report of 2016 it was found that the predicted revenues from world wide export by the Indian IT-BPS companies is USD 116 for the Year of 2017.And it would be 124-125 billion USD for the year 2018.This will provide an expected growth of 7-8 %.And the expected Domestic Revenues will be 24 USD dollar for the year 2017 and 26 -26.5 USD for the year 2018.This will provide an expected growth of 10-11%.The worldwide software services growth is expected to be 5.4 % in 2017 over 3.2 % in 2016.

R & D EXPENDITURE OF OTHER IT COMPANIES

Here are the details of the R and D Expenditure of other companies as a percentage of sales.

Table 2 : R & D Expenditure of Other Companies

	As percentage of sales	
Company	R & D Expenditure	Sales & Marketing Expenditure
SAP	14%	25%
Symantec	15%	40%
Oracle	13%	20%
IBM	6%	1%
Microsoft	13%	20%

Source : nasscom.in

INFOSYS SUBSIDIARIES IN OVERSEAS AND THE R & D EXPENDITURE

Table 3 : Onshore and Offshore revenues of Infosys

	2017	2016
Onshore revenues	54.2	52.7
Offshore revenues	45.8	47.3

Source : nasscom.in

Onshore revenues are for the works which are done for the development centers outside India whereas offshore revenues are the revenues which are done at the development centers in India. But though the revenues from onsite centers are with higher percapita; they are with a lower gross margin.

Table 4 : The Billable Hours Expended

	2017	2016
Onsite	27.2	26.6
Offshore	72.8	73.4

Source : nasscom.in

So the onsite revenues have a great impact on the margins of the revenues of the software companies.

Table 5 : Segmental Income of Infosys

SEGMENTAL INCOME OF INFOSYS					
	Europe	North America	India	Rest of the World	Total
Revenue from Operations	38578	13019	1798	5894	59289
Identifiable Operating Expenses	6664	20337	786	2805	30592
Allocated Expenses	2523	7479	345	1133	11480
segmental Operating Income	3832	10762	667	1956	17217

Source: Infosys Annual Report

NEW PROSPECTIVE AREAS OF LEARNING & KNOWLEDGE MANAGEMENT FOR INFOSYS

Table 6 : IT Revenue Break Up Chart of Indian IT Companies

YE-AR	EXP-ORT	DOME-STIC	E-COM-MERCE	HARD-WARE	TOT-AL
2012	69	26	13	13	121
2016	108	22	13	13	156
2017	116	24	14	14	168

Source: Annual Reports

From this it could be understood that the major opportunity for growth lies in the export of software technologies. And the export area shows a consistent growth. The other areas like domestic, e-commerce, hardware do not show a consistent growth. The total Incremental revenue added in the financial year of 2017 is USD 12 billion. Also there has been a consistent growth of 47 billion USD spanning in the last 5 years. So the future prospects show a growth in the IT industry.

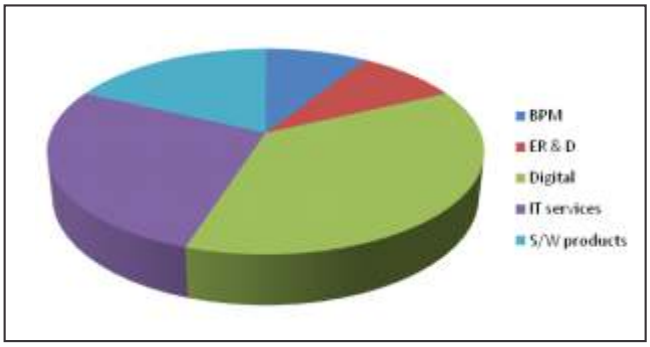
Table 7 : Type of Revenues generated and the percentage

Type of Revenue	FY 2012	FY2017
Onshore revenues	48%	59%
Platform revenues	4-7%	7-10%
Digital Revenues	4%	15-20%
Digital M & As	39%	64%

Source: Annual Reports

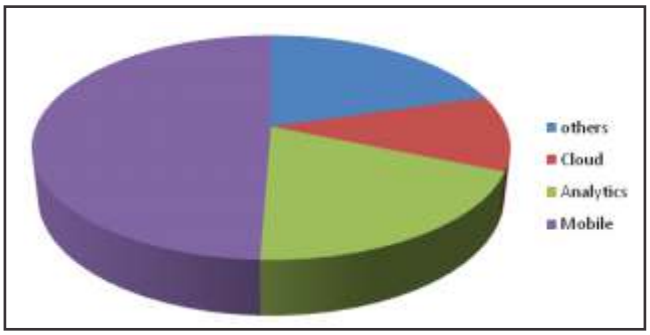
So the prospects lie in the Artificial Intelligence, Design, and Cloud etc. Also there should be value creation by the sharing of the risk with the customers. Since the share of the digital revenue shows more the propensity for growth and contribution to the revenue is projected more in this area in the coming years.

Figure 3 : The Percentage in M & A s



Source: Annual Reports

Figure 4 : The Percentage of Factors in Digital



Source: Annual Reports

The new job roles hover mainly around the mobile networking area which constitutes the major chunk of the digital technologies. It can be in the areas of mobile app development, development of interfaces, Social media, data scientists, cyber security etc. And the new skills are Internet of Things, Artificial Intelligence, and Cyber Security etc. Other prospects-the digital payments have got an annual compound growth rate of 50%.The e- commerce sector is growing by 19 %.The mobile transactions has increased by 40 times in the last years (nasscom.in).

ANALYSIS OF THE R & D EXPENDITURE RETURNS AND ITS LINKAGE WITH INNOVATION

Here the expenditure on the R & D is showing a decreasing trend and rises up in 2011, 12, 13 and then again decreases. At the same time the RORC is showing a decreasing trend until and then shows an increasing trend in 2015. So the investment in the Research and Development activities may becoming evident in the later periods that is within a span 2-3 years. So also the fact whether the increase in the innovative element in the R & D activities, leads to the proportionate increase in the returns of the organization is to be explored further. The McGrath Romeri formula for the effectiveness of R & D is not used here since its credibility is to be proved by further researches

But the R & D expenditure in Infosys is not directly related to innovation. Usually a small portion of the R & D is used for innovation. The majority of the R & D expenditure is used for testing the configurations of the software already present. So the R & D expenditures are not necessarily leading towards innovation. According to the annual report of the Infosys 2016-2017; it is giving importance to software led automation. The automation is for replacing people with machines. So the R & D is going on in the sector of Data analytics, knowledge creation, process monitoring, and fixing test frame works etc. These are for the automation of services in BPO sector, services, infrastructure etc. Panaya is software developed by Infosys for automation in the field of enterprise resource planning (ERP). This helps the businesses to develop test scripts of the business processes and at the same time it can be documented. This will help to save time, costs etc associated with the business processes. Assist Edge which is robotic automation equipment will help to digitalize the business processes very well. Also Nia is software which will help in the automation of the information technology based business processes. It helps in the data extraction, classification, resolution of the data etc. This will help to automate the processes of deterministic, intelligent and cognitive areas. This has almost helped to replace work force of more than

11,000 inside Infosys. So many other sectors are also using Nia platforms like pharmaceutical sectors for the forecasting of sales, fraud analysis for the banks etc. The company adopts the method of zero distance where the company maintains a nil distance of providing cutting edge technologies to the clients. The Skava Platform of the client provides customized solutions to the customers also. When a firm faced difficulties in reconciling with the monthly end statements they were automating the process and the suitable solution was found out .All these show that the Infosys is concentrating around testing new configuration of existent ones but there is an increasing tendency towards innovation which may gain sufficient momentum in future.

But on the basis of the knowledge management theories of Zack (1999) categories knowledge thus- 'the core knowledge'-essential for existence, 'advanced knowledge'-which provides the competitive survival capability, 'innovative knowledge'-which helps the innovative long term competitive advantage capability .This can be connected to the Baker & Sinkula (1999) multiple orientations where market orientation can be connected with adaptive learning which leads into Zack's 'core knowledge' and may lead into 'advanced knowledge' if it helps it to survive in the industry. But this has to be proved in later years. The 'generative learning' of Baker & Sinkula can be connected with the 'innovative knowledge of Zack. And the R & D capabilities and multiple orientations can be identified on the basis of this definition. The Infosys is trying hard to survive in the competition. Also innovations are just to satisfy the needs of the customers in the market. There is no generative learning taking place here. So there is no innovative knowledge creation in Infosys. Only adaptive learning is taking place here. So only 'core knowledge' which may lead into 'advanced knowledge' is taking place here. There is no combination of different learnings or multiple orientations. It is mainly confined to adaptive learning resulting into marketing orientation. Also in connecting this with Schindehutte (2008) definition of multiple orientations it could be understood that 'marketing' and 'technological' orientations are present whereas the 'entreprenuerial' orientation is absent. The 'entrepreneurial orientation can be connected with Baker & Sinkula's 'generative learning' and Zack's 'innovative knowledge'. So entrepreneurial orientation, generative learning and innovative knowledge is totally absent in Infosys.

Since new software products are to be developed in the software sector within a short span of time, the product life cycle is very short in the software sector. But at the same time the spending on R & D cannot be avoided for Infosys in order to survive in the Industry. But in relating the product life cycle with the R & D spending; the R & D expenditure in developing one software cannot be expected to produce returns for a longer period. So even though R & D activities are efficient and effective it may not provide sufficient profits due to the shorter product life cycle.

Also though there is sufficient income from the onsite centers their gross profit margin is low. So they cannot be said as deriving sufficient income for the R & D expenditure. .Since the segmental operating income is highest for the European segment ,there is scope for further studies whether the income obtained from there should be utilized only for the R& D innovation expenditure in the European area or for the all the areas in general. This extends the scope of the argument on the applicability of multiple orientations -should be region based or based globally. Also this shows that knowledge management is a dynamic process of interaction with the customers, other stakeholders, technology, innovative capacity etc. So the integration of these learning and multiple orientations are essential within a company. Also the nature of multiple orientations in new areas of technology like cloud analytics are to be further explored. Also the combinations of multiple orientations are subjective to each organization, The suitable combination should be derived on the basis of the core, advanced and innovative knowledge generation and management within an organization which will lead into multiple orientations. This will differ from organization to organization which was proved by previous researches.

CONCLUSION

The R & D activities are not producing immediate returns. The definition of R & D is not related to innovation in Infosys. The R & D expenditure is not leading into innovations. It is just for testing the configurations of new software. So the company is not able to move from the realm of core knowledge which may lead into advanced knowledge. Multiple orientations is lacking in Infosys. They are concentrating mainly on the adaptive learning and market orientation in the multiple orientations. The entrepreneurial orientation is totally absent and there is no innovative knowledge creation. Also it is confined to core knowledge and advanced knowledge creation. So a new perspective to learning, research and innovation will help the Infosys to gain competitive advantage over other IT companies. Also the onsite segmental revenues are insufficient to fund the R & D activities. Also in the context of the modern technologies like cloud computing, digital analytics etc, the scope and the opportunities gained from multiple orientations are ever increasing. The IT companies cannot thrive just by investing in developing new software. They could only survive by the combinative learning resulting in multiple orientations resulting in innovative knowledge. Also different learning combinations may ask for the challenge of different type of knowledge management. Knowledge Management is inevitable for the survival of software companies including Infosys. Also knowledge management and learning and the suitable combinations of multiple orientations is subjective to an organization. So learning strategy should be developed and the multiple orientation should be strategically combined based on the learning within an organization.

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