

Role of Innovation in Global Economic Development- An Empirical Study

***Ms.S.Sangeetha**

****Mr. K. Ram Kumar**

*Assistant Professor (Sr.), KCT Business School, Kumaraguru College of Technology, Saravanampatti, Coimbatore, Tamilnadu- 641049, India

**Student, KCT Business School, Kumaraguru College of Technology, Saravanampatti, Coimbatore, Tamilnadu- 641049, India

Abstract:

A country's growth nutrition lies on the two constant driven wheels ie, agricultural and industry. Upstream speedier exponential growth depends heavily on the corporates' housed in that country. Companies which excel in creating new products and services capture most of the market share throughout the world. The growth of country depends on the income for a company and taxes. This also enriches huge amount of employment opportunities and improvises the standard of living of the people and in turn contributes to the economic growth. They spend more on their Research and development to register more innovative ideas as patents with their tag names. This in turn elevates the reputation of the nation among other countries. Global R&D intentions returned to the long-term growth trend and grew at 5.8% in 2013 to the highest total ever, \$638 billion. This paper aims at finding the correlation between R&D and patents of various developed economies which ultimately results in innovation, the backbone of their development. A comparative study is made to find the probability of India to become one among those developed economies.

Introduction:

The innovation can never be always focused only on technology. It depends on a deep vein of creativity that is constantly renewing itself, and on a countless of creators who can imagine how people can use things that have never been available before, create creative marketing and sales campaigns, understand and build gadgets which are close to the heart of people and imagine new kind of software that will capture people's imagination and become indispensable to millions.

An Israeli startup called Kaiima uses genome multiplication to increase the yield of crops with a least amount of consumption of water and strengthen plants to withstand any type of harsh environmental factors. Thus anything which improves the current state of people or provides a new dimension to the existing problem is an innovation.

Objectives of the Study:

The primary source of consistent growth depends only on the innovation made by the country as per the economic growth theory. Since the recognition in the 1990's of the relationship between technological progress, innovation and economic performance, investment in research and development has grown rapidly, along with a widening of innovation activity across many sectors of the economy. Innovation is now emerging as the primary tool of economic development strategy across the world. The company's aiding the innovation helps the country to boom on its economy. The country in turn provides a healthy environment for the company to explore its innovation practices. Thus the objective of this paper is focused on learning the following objectives

- To study the increased importance of innovation over a period of time
- To identify the total global R&D expenditures over a period of time
- To understand the Sectors sparing huge Research & development Expenditure
- To study the impact of Research & Development expenditure spending on revenue

- To know the most innovative and R&D expenditure spending corporates globally
- To understand existence of the convenient environment to claim patent rights.
- A comparative study on the R&D expenditure with the patents registered

Methodology:

The study will enlighten the opportunities for a country to flourish and have a rapid growth through innovation as a major pillar.

Type of study:

The study is descriptive as it ponders and hovers around on the various economies around the world which went upstream by innovation and R&D.

Secondary data:

Data relating to expenditure towards R&D by various countries, their patents registered year on year and their corresponding growth have been collected through various reports published online and a comparative study of various economies have been made.

Analysis & Interpretation

Objective 1: To study the increased importance of innovation over a period of time

Innovation need not be always a result of billion dollars. It can be so simple that can topple the traditional trend and establish its own way of getting things done. One such innovation is Whatsapp, an android messenger. According to research from Ovum limited free social-messaging applications like WhatsApp cost phone providers around the world, booked fees of about \$32.5 billion in texting fees in 2013. This figure is projected to reach \$54 billion by 2016. This amazing innovation kindled Mark Zuckerberg to buy Whatsapp for \$19 Billion. Facebook in order to capture the mobile market, where it had a revenue of \$1.37 Billion made a strategic move in acquiring the must have mobile application Whatsapp.

Table No: 1

Table showing the increased importance of innovation over a period of time

Innovative product	Acquired company	Value of the deal (in Billion USD \$)	Year	Revenue per year
Whatsapp	Facebook	19	2014	\$ 20 Million
Skype	Microsoft	8.5	2011	\$ 2 Billion
Youtube	Google	1.65	2006	\$ 5.6 Billion
Android	Google	50 Million	2005	\$ 6.8 Billion

Source: Varied sources

Ideas from of major players have turned the trend to upside down in this fast moving world. Android software which was readily accepted by Samsung, a South Korean based multinational conglomerate company made its way to the top of list and acquire most of the market share to grow as the leading mobile manufacturer. Samsung has gained \$5.1 Billion revenue by moving on to Android operating system. Nokia, a Finland based company on the other side failed to provide innovation in its software, realized that it has to surrender to its own software vendor, Microsoft for \$7.2 billion. The above table reflects that the recent era is all about innovativeness of products rather than the revenue generated from the product. In 2005 the greatest innovation was acquired for

just \$50 Million, but in 2014 a low revenue generator is bought for \$19 Billion because of the impact it has created by it.

Objective 2: To identify the total global R&D expenditures over a period of time

Table No: 2

Table showing the total global R&D expenditures over a period of time

S. No	Year	R& D Expenditure (USD) in Billions	CAGR (%)
1	2002	353	-
2	2003	355	0.6
3	2004	369	3.7
4	2005	391	6.2
5	2006	417	6.5
6	2007	450	7.9
7	2008	495	10.0
8	2009	521	5.4
9	2010	503	(3.5)
10	2011	550	9.3
11	2012	603	9.6
12	2013	638	5.8
		11 year CAGR	5.5

Source: Bloomberg data; Capital IQ data; Booz & Company Innovation 1000 articles in strategy + business; Booz & Company analysis

CAGR - Compound Annual Growth Rate

The global R&D expenditure is on an exponential curve which supports innovation to a larger extent. The table shows the global expenditure of R&D compared with the compound annual growth rate. In most of the cases the table explores that the R&D expenditure and CAGR are directly proportional. During the period of global recession (2009), there was a dip in CAGR even though the R&D expenditure is high, but this trend revived after 2011.

Objective 3: To understand the Sectors sparing huge Research & development Expenditure

Table No: 3

Table showing the comparison on Research & development Expenditure among different sectors during 2012 and 2013 and Sectors sparing huge Research & development Expenditure

Industries	R& D Expenditure by Industries (in %)		Change in 2012-13 R&D expenditure(USD Bn)
	2012	2013	
Software & Internet	7	8	9.3
Healthcare	21	22	9.2
Automotive	16	16	7.4
Industrials	10	10	3.4
Computing & electronics	28	27	3.4
Telecom	2	2	2.6
Consumer	3	3	0.8
Other	2	2	0.7
Aerospace & Defense	4	3	0.1
Chemicals & Energy	7	6	-2
Total R & D spent	USD 603 BN	USD 638 BN	34.8

Source: Bloomberg data; Capital IQ data; Booz & Company Innovation 1000 articles in strategy + business; Booz & Company analysis

With a global expenditure of \$638 Billion, Computing and electronics takes the major share of 27% among all other sectors. It is followed by Healthcare with a contribution of 22%. On a comparative study between the year 2012 and 2013, the rate of expenditure towards software and internet tends to be on a higher rate at \$9.3 Billion more than the previous year. This is because among all the other sectors this becomes the youngest sector and it has more scope towards innovation.

Objective 4: To study the impact of research & expenditure spending on revenue of top 10 corporates globally

Table No: 4

Table showing the impact of Research & Development expenditure on revenue of top 10 corporates globally

Rank	Company	2013 Overall R& D Spending & Rank		2013 Revenue (\$ Mn)	Spending as % of Revenue (Intensity)
		Spending (\$ Mn)	Rank		
1	Apple Inc	3,381	43	1,56,508	2.20%
2	Google Inc	8,661	12	50,175	13.50%
3	Samsung	10,447	2	1,78,621	5.80%
4	Amazon.com Inc	4,564	30	61,093	7.50%
5	3M Corp	1,634	85	29,904	5.50%
6	General Electric Co	4,520	31	1,44,796	3.10%
7	Microsoft Corp	9,811	5	73,723	13.30%
8	Intl Business Machines Corp	6,302	16	1,04,507	6.00%
9	Tesla Motors Inc	274	377	413	66.30%
10	Facebook Inc	1,399	101	5,089	27.50%

Source: Bloomberg data; Capital IQ data; Booz & Company Innovation 1000 articles in strategy + business; Booz & Company analysis

The top ten R&D spending companies managed to cope up with ten most innovative companies only on a five year average of the earnings margin. They failed to match with the industry they belong in terms of growth in both revenue and market capitalization. The list of top R&D spenders is dominated by auto and healthcare companies. From these sectors, only one company, Tesla motors appears on the list of top innovator representing that innovation success isn't about how much money a company spends, but how they spend it for their progress.

Objective 5: To know the most innovative and R&D expenditure spending corporates globally

Table No: 5

Table showing the Top 20 Company's R&D Spending industry wise

Industry	Company	Geography	2012 spending Billions of \$)	R&D (in Rank
Auto	Volkeswagen	Germany	11.4	1
	Toyota Motor Corp	Japan	9.8	6
	General Motors	Detroit	7.4	11
	Honda motor Co	Japan	6.8	13
	Daimler AG	Germany	6.6	14
Computing & Electronics	Samsung	S. Korea	10.4	2
	Intel corp	Santa Clara	10.1	4
	IBM	Armonk	6.3	16
	Nokia OYJ	Finland	6.1	18
	Panasonic Corp	Japan	6.1	19
	Sony Corp	Japan	5.7	20
Health	GlaxoSmithKline	Brentford	6.3	17
	Roche Holding AG	Switzerland	10.2	3
	Novartis AG	Switzerland	9.3	7
	Merck & Co Inc	New Jersey	8.2	8
	Pfizer Inc	New York	7.9	9
	Johnson & Johnson	New Jersey	7.7	10
Software & Internet	Sanofi	France	6.3	15
	Microsoft Corp	Washington	9.8	5
	Google Inc	California	6.8	12

Source: Bloomberg data; Capital IQ data; Booz & Company Innovation 1000 articles in strategy + business; Booz & Company analysis

The sector wise analysis of the top R&D spenders reveals Volkeswagen to be at the top when compared to all other sector with an expenditure of \$11.4 Billion. This shows that the auto major tends to capture the market with more of innovative products. They were able to have a larger market because of the competitive advantage of their location, Europe. Within the Euro area, the Euro currency can be used. This makes the cost of owning a Volkswagen to be lower than rivals. Samsung taking the next place with \$10.4 Billion on a focus of advanced technology at affordable price to the people. According to Bloomberg survey, South Korea has hoisted the electronics giant as the topper in

encouraging innovative businesses. Roche Holding AG also have the same cost advantage as that of Volkeswagen and hence they were able to spend more on R&D at \$10.2 Billion.

Objective 6: To understand existence of the convenient environment to claim patent rights

Table No: 6

Table showing the patents obtained by the top 6 countries and India

Year	Number of Patents secured by Top 6 countries and India						
	JAPAN	CALIFORNI A	GERMAN Y	TAIWA N	UNITED KINGDO M	FRANC E	INDIA
Pre 1999	363919	179102	153044	20125	59397	59943	499
1999	32514	18860	9895	4526	3884	4097	114
2000	32922	19845	10824	5809	4081	4173	131
2001	34890	20859	11894	6545	4344	4456	180
2002	36339	21235	11957	6730	4187	4421	267
2003	37248	22074	12140	6676	4025	4126	356
2004	37032	21602	11367	7207	3891	3686	376
2005	31834	19662	9575	5993	3551	3106	403
2006	39411	25044	10889	7920	4321	3856	506
2007	35941	22601	10012	7491	4027	3720	578
2008	36679	22203	10085	7779	3832	3813	672
2009	38066	23356	10352	7781	4004	3805	720
2010	46977	30080	13633	9636	5029	5100	1137
2011	48256	30750	12967	9907	4910	5023	1259
2012	52773	34660	15041	11624	5876	5857	1734
Total	904801	511933	313675	125749	119359	119182	8932

Source: US patent and Trademark office

One of the bases for patents is that they stimulate economic and technological development and promote competition by creating a financial motivation for invention in return for the discovery of an invention to the public. “Studies on the R&D and patent relationship performed on cross-sectional or panel data at the firm, region or country level lead to the conclusion that there is a significant correlation between R&D inputs and patent counts” stated by Mr. Jerome Danguy.

Japan being known for innovation holds the most number of patents with 904801. Companies like Panasonic, Sony and Honda, hosted in Japan, excel in their respective sector because of their innovative products obtained as a result of R&D expenditure and the economy in which they persist. Volkeswagen and Daimler AG are the top in auto industry in Research & Development expenditure which helps in crafting

the perfection in their products. It contributed Germany to acquaint a lot of patents to an extent of 3,13,675 patents. On the other side India holding only 8932 patents, being not able to hold a position in the top 50 of the Innovative companies list is due to their very low expenditure towards R&D, \$36.1 Billion. The estimated elasticity of patents with respect to R&D is generally found to be positive. But there are a few variations based on the economy which they survive. But a country can excel only when their contribution towards R&D is significant.

Objective 7: A comparative study on the R&D expenditure with the patents registered

Table No: 7

Table showing the Comparison of the amount spent on R&D with the patents registered in different economies.

Economy	Research and Expenditure outlay (in Billions of \$)	Percentage of GDP (in %)	Number of patents	Highlights
United States	405.3	2.7	25,67,724	Topper in R&D expenditure & Patents
China	296.8	1.97	33,894	Lag in innovation index
Japan	160.3	3.67	9,04,801	Second in Patents
Germany	69.5	2.3	3,13,675	Good in manufacturing capability
South Korea	55.8	3.74	1,12,247	Leading innovator as per Bloomberg survey

Source: US patent and Trademark office

It is found that developed and emerging economies are having high Research and Development outlay. US being the top in Research and development expenditure had a proportion of 2.7% of their GDP. It is followed by, China which is 1.97% of their GDP. The expenditure towards R&D is in proportion to the patents being registered. United States takes a lead by a cumulative total of 25, 67,724 patents till 2012. Japan takes next place on this side with a cumulative of 9, 04,801 patents, where their R&D expenditure next to China with \$160.3 billion contributing 3.67% of GDP. But not only the expenditure towards R&D, other factors also contribute to the patents being registered like the knowledge of the people, ecology of the country etc. This is because though China spends more on R&D, they lag in their innovation index. They have contributed only 33,894 patents in spite of their huge R&D expenditure.

Conclusion:

The paper reveals that there is a strong connects between the R&D expenditure towards and the patents availed which in turn affects the economy of a country. India spends \$36.1 Billion ad contributes only 0.9% of its GDP, which will be very hard to endow as a

super power. This comparative study reveals that the trading policies related to R&D should be redrafted and formulated in such way it encourages the domestic and foreign companies to enter and participate in developing innovative products and processes on a longer run basis. This not only improvises the operations but will enable India to put it mark on the globe.

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