



**Proceedings of International Conference on Strategies in Volatile and Uncertain Environment for Emerging Markets**  
July 14-15, 2017  
Indian Institute of Technology Delhi, New Delhi  
pp. 68-74

## **Economic Factorization of Reverse Innovation in Circular Economy influenced by Invisible Innovation from Developing Economies**

**Anuraj Gupta<sup>1</sup> and Lawlesh Tiwari<sup>2</sup>**

### **Abstract**

*Paper propounds that Invisible Innovation in developing economies leads to cost optimization as required for the product to be sustainable and competitive in local markets. This feeds into Circular Economy and Reverse Innovation by way of economic translation. It studies the market factors leading to this translation and its self-propagating nature. We have thus build a process chart of relation between Reverse Innovation, Circular Economy, Invisible Innovation and Economic Translation Factors. The underlying theory of the paper is that developing economies, trying to achieve economies of scale for mass customization, leverage circular economy and invisible innovation. Following the success of the same and its viability in developed economies completes the cycle for reverse innovation.*

**Keywords:** Cost Optimization, Circular Economy, Economic Translation Factors, Invisible Innovation, Mass Customization, Reverse Innovation.

---

### **1. Introduction**

Innovation is derivation of value from a new way of thought or production. This is primarily driven by developed economies, where the capital available for pioneering investment is higher. Essentially an investment is capital invested into potential failure or long term gain instead of short term benefits. This type of capital is more readily available in developed economy and thus most innovations are expected to flow from developed to developing economy. However in recent times it has been observed that there is a reverse flow of innovation from developing to developed economies. This type of innovation has been termed as Reverse innovation as identified by Prof Vijay Govindarajan from the original case of General Electric. These innovation thus drive value creation and capital flow from developed economies to developing economies thus boosting their race to prosperity.

Most of the innovation in developing economies is driven by the concept of frugality, or in other words the need to conserve resource and drive maximum possible value from limited and available resources. This is one of the primary factors to push reverse innovation as well. We have tried to derive other factors and flow of processes driving reverse innovation as well as try to understand the impact of the same in an anticipated circular economy.

- 
1. MA. Economics, Bhartiya Vidhya Peeth, Pune  
E-mail: guptaanuraj2509@gmail.com
  2. Lawlesh Tiwari, Independent Researcher  
E-mail: lawleshtiwari@gmail.com

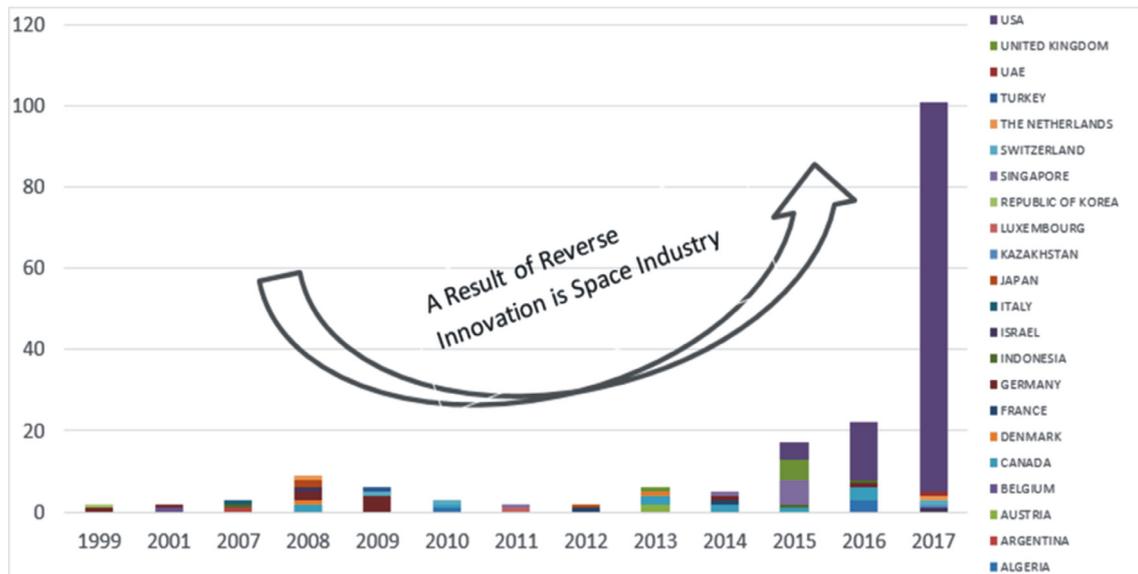
## 2. Factors for Reverse Innovation

### 2.1 Original Case: GE-HealthCare

General Electric had made its first high end CT imaging system in India with a thinking that compresses a strategy for all of GE's businesses in India. GE Healthcare started selling its products in India in the 1960s. In 1990, the company created a joint venture with Azim Premji's Wipro Group and, over the next few years, set up manufacturing plants in India. GE Healthcare began offering its feature-rich and high-priced CT, magnetic resonance imaging, X-ray, ultrasound and patient-monitoring systems to Indian customers. It tried to lessen the cost by eradicating features, and it made some products locally. Vijay Govindarajan, professor of international business at the Tuck School of Business at Dartmouth College, who spent two years as a GE professor in residence and chief innovation consultant, calls the company's strategy "Reverse Innovation". "Historically, innovations have always happened in rich countries," he pointed out, "But in the future, innovations must take place in countries like India and China, because this is where the bulk of the customers are. The needs are more pressing here and the sheer volumes will justify the investments that will be required for developing the appropriate products."

### 2.2 Study Case: ISRO-PSLV-C37

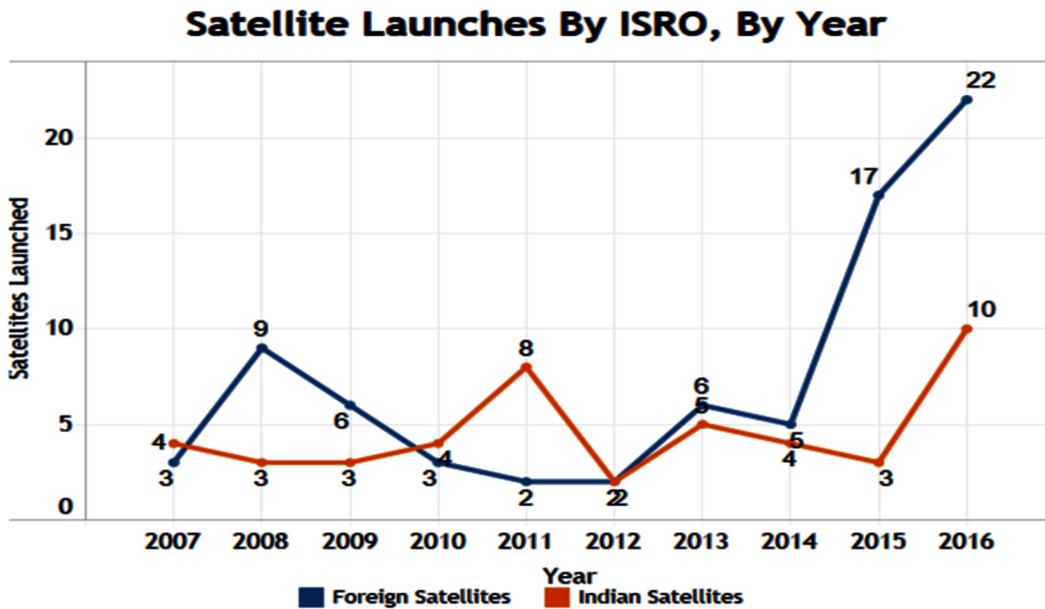
Peter F Drucker said "If you want something new, you have to stop doing something old" which speaks well for the involvement of Invisible Innovation done by ISRO for a push for Reverse Innovation. Out of the 104 satellites, only 3 were Indian. The rest 101 satellites belonged to USA, Netherlands, Israel, Switzerland, and Kazakhstan. As we can see the stats US, a well-developed nation used India's PSLV -C37 to launch its 88 satellites due to cost effectiveness as NASA would have charged \$100, SpaceX would have cost as \$50Million.



Graph 1

Factors that rove Developing countries to shake hands on launch of their satellites

1. Technological feat of ISRO
  - a. Capability to offer quad packs
  - b. Algorithms for precise steering of satellites to orbit.
  - c. Tuning to avoid any collision
2. Dependability of PSLV in placing satellites into orbit.



Graph 2

The launch cost for this mission was approximately \$15 Million half of which was recovered by foreign satellite launch.

#### *Invisible Innovation behind ISRO's Success*

ISRO ranks 9<sup>th</sup> on global agency budget rankings, with US NASA beating its closest competition Russia by 250% and ISRO by 1300%. This drives different kind of thought process to be successful in comparison. There wasn't too much technological dive involved major chunk was thought and process. Smaller and lighter satellites have made it possible for rockets to transport more of them, which can be attributed to technological advances. However, the way those satellite, their launches and positions, planned and purposed is only a way of thinking and scientific calculation. The number of satellites that can be encumbered on a rocket is restricted only by the space available and the carrying capacity of the launch vehicle in terms of weight. But satellites must be stacked together in certain configurations so that they can be ejected in desired orbits without disturbing the flights of others or colliding with each other. Developing reusable rockets, space capsules and other material, is one such example, while creating the most suitable telemetry from astronomical calculations is another.

### **2.3 Factorization**

The cases prove that the bulk of reverse innovation was driven by the need of local economies in the developing nations. These needs can primarily be factored under one the head viz. frugality. The local customer base had lower levels of Purchasing Power Parity and the organizations involved had lower budget in the developing economies. This requires that products cut prices to cater to the local markets. There are two basic methods of delivering this high value at low prices viz. Technological Breakthroughs and Process Innovations. Technological Breakthroughs in themselves require heavy investment in possibility of failure and subsequent cycles. Therefore, the bulk of responsibility in innovation lies with process innovations which are invisible to market. The success of these innovations then also requires the ready availability of labor, compliance and other cost inducing factors at lower costs which are supported in developing economies. Thus three main factors to a successful reverse innovation are 1) Frugality, 2) Low Cost Dynamics in Labor and Capital Goods Market and 3) Lower Governance and Compliance Cost Burden. However the true success of a reverse innovation lies with successful disruption of developed economies which majorly is defined by the Barrier to entry of imported goods and services, along with bilateral economic flow of global economy. These two factors have been on the rise in the past few decades which has resulted in the rise of reverse innovation success.

## **3. MODEL**

### **3.1 Linear v/s Circular**

Linear economy is based on the principle of conversion of resources in linear fashion from raw capital goods to consumer goods and post consumption to waste. It has been argued that this system is based on cheap materials, energy and credit. Cheap material premise is turning obsolete with the rise in consumption due to high demand on the limited resources. These resources are getting ever more limited due to the originally used materials turning into waste dumps. This leaves the alternative to produce more resources by identifying new sources or repairing, reusing or recycling the original waste. Cheap Energy from traditional sources is again threatened by the same principle of scarcity of resources. This leaves the alternative of investing into alternate, renewable and perpetual power sources which are increasingly becoming cheaper and have a lower TCO over the long run. Cheap credits are also a thing of the past as the real growth of economy in most parts of the world is stagnating with very low and in some cases even negative rise in the purchasing power parity. This requires the products to be cheaper still for sustainability and viability of the business and economy over the long run. This can only result from creating higher value from the same limited and diminishing resources. All of alternatives are the way of the system that is termed as Circular Economy.

Circular economy rests on the principles or bending the tail of linear economy by repair and reuse followed by recycling produce materials that compete with virgin raw materials. This is derived from linear economy by way of change in the processes of producing a product rather than change in the product itself. Such non-market facing innovation is called invisible innovation.

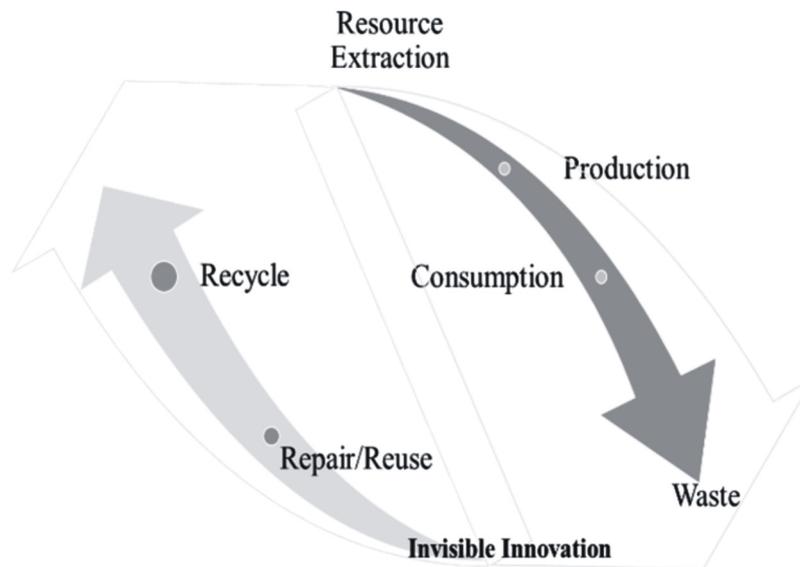


Figure 1: Invisible Innovation

### 3.2 Invisible Innovation

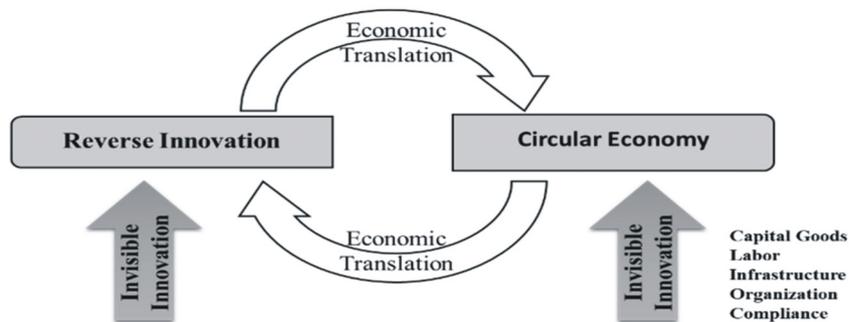
A new product/solution that arrives in the market to solve an existing problem or capture a new mind share is a market facing change, and is thus termed visible innovation. Change in the way of producing a consumer good/service is not visible to end user and thus is called an invisible innovation. This can be achieved mostly by way of any change in value or management of Capital Goods, Labour, Infrastructure, Organization, and/or Compliance, which are primary components of the process of delivering goods or services. All forms of innovation breed competition, as they are essentially capturing a piece of existing market or generating a new market (in case of pioneering investment). Invisible innovation in this case is no different. In developing economies the Purchasing Power Parity is lower and thus is also the budget for pioneering innovation. However, this also readily makes available the Capital Goods and Labour to be available at cheaper costs. Invisible innovation is then further supported by lowering the cost of infrastructure and compliance to such organizations through Government Programs. The one true factor that is entirely dependent on the Producers is the Organization i.e. their modus operandi. The way the organization is structured and operates is what then sets it apart in delivering a competitive product or service at a considerably lower price thus generating a self-propagating engine for such innovation.

### 3.3 Self-Propagation of Reverse Innovation Cycle in Circular Economy

The finitude and diminishing nature of virgin raw material drives its cost forever upwards and the general value associated with it only rises with innovation in creation and utilization of the same. Circular Economy reduces this burden by creating raw materials from used goods which then directly compete for market with virgin raw material. This competition thus moderates the costs and drives the need for further innovation in creation of the materials. Invisible innovation creates and drives the major chunk of Circular Economy and is also the major contributor to Reverse Innovation as we have already studied in the paper earlier. Thus with this common factor a rise in one also contributes to the rise of other. Circular economy also feeds into

*Economic Factorization of Reverse Innovation in Circular Economy influenced by Invisible Innovation from Developing Economies*

lowering the cost of production and thus enables reverse innovation in developing economies as there the need for lower cost for higher value is greater. As already discussed the true success of Reverse Innovation is in its capacity to disrupt developed economies. As reverse innovation rises, using circular economy as its contributing factors, through its competitive edge drives other organization to adopt circular economy, which feeds into the market. This requires then to streamline circular economy and other parameters to reverse innovation so that it does not lose its competitive edge. This creates a self-propagating cycle for both reverse innovation and circular economy supported by invisible innovation. This is best characterized by the following process chart Figure 2.



**Figure 2: Self-Propagating Cycle for both Reverse Innovation and Circular Economy**

#### 4. Effects and Outcomes

As evident from the chart that Reverse Innovation and Circular Economy supported by Invisible innovation are capable of creating a self-propagating cycle. This cycle is further supported by the fact that the world is losing resources at an unprecedented rate and the need for sustainability has never been greater with the world priming for sixth extinction level event as proposed in Malthus theory due to the rise of population. The rise of population creates greater demand in the market for goods and services which results into two major phenomena which are anti-supportive to sustainability. The burden on resources rises creating higher prices but the value doesn't rise proportionally and thus creates lower PPP. Higher populations in linear economy also result in the generation of higher amounts of waste which further deplete resources, while also contributing to the destruction of natural systems in other ways. Malthus Theory predicts when the burden of populous becomes unbearable on resources a tipping point is reached that brings the population down in such a way to be sustainable for a while. One of the major ways that relieves this pressure is encapsulated in Circular Economy and thus it would appear that circular economy is inevitable.

One way to support this is to create goods and service by proactively evaluating them for circular economy. The value of a resources in circular economy can be measured in effect by something that we would like to term as Reusability Index. All materials depreciate over the years and at the end of their use cycle have the lowest possible cost. The product can be bought back at this depreciated cost and then recycled to convert them back into raw material for further processing. This recycling cost added to the depreciated cost thus becomes the overall cost of the raw material now. This eliminates the disposal problem and thus, the disposal cost saved and should be accounted for in the equation. This recycled raw material is now in direct competition with virgin raw material and thus its value can be compared to it. Our propose

is that since at the time of manufacturing the future costs need to be calculated for reusability index, as depreciation will be unaffected by inflation and recycling cost and raw material cost will directly be affected by inflation. The formula for reusability considering the effect of inflation balanced out would be the ratio of cost of virgin raw material to the sum of depreciated cost of the goods and their recycling cost.

If depreciated cost is represented by D, the cost of recycling by R and the cost of virgin raw materials by V then the Reusability Index I can be calculated by

$$I = \frac{V}{D + R}$$

## 5. Conclusion

The cases studied result in the understanding that support and need for invisible innovation in developing economies couples reverse innovation and circular economy. As conclusion our study is based on a qualitative study of the current economic conditions like to propose the inevitability of a circular economy riding on the wave of a self-propagating cycle in junction with reverse innovation. This would create higher levels of sustainability for a longer period of time than the current linear economy can sustain. Circular economy is expected to be adopted globally and the organizations can leverage invisible innovation to convert their production process accordingly and leverage materials with higher reusability index to turn higher profit margins.

## References

- Circular Economy Overview (n.d.) Retrieved from Ellen Macarthur Foundation: <https://www.ellenmacarthurfoundation.org/circular-economy/overview/concept>.
- Fitzgerald, M. (2009, 1 3) How Innovations from Developing Nations Trickle-Up to the West, Retrieved from Fast Company: <https://www.fastcompany.com/1150211/how-innovations-developing-nations-trickle-west>.
- From Linear to Circular-Accelerating a Proven Concept. (N.D.) Retrieved from World Economic Forum: <http://reports.weforum.org/toward-the-circular-economy-accelerating-the-scale-up-across-global-supply-chains/from-linear-to-circular-accelerating-a-proven-concept/>
- Govindrajan, V. (2009, 10 15) What is Reverse Innovation, Retrieved from Vijay Govindrajan's Blog - Tuck School of Business at Dartmouth : [http://www.tuck.dartmouth.edu/people/vg/blog-archive/2009/10/what\\_is\\_reverse\\_innovation.htm](http://www.tuck.dartmouth.edu/people/vg/blog-archive/2009/10/what_is_reverse_innovation.htm)
- India's Reusable Launch Vehicle-Technology Demonstrator (RLV-TD) Successfully Flight Tested (2016, 5 26), Retrieved from ISRO: <http://www.isro.gov.in/update/23-may-2016/india%E2%80%99s-reusable-launch-vehicle-technology-demonstrator-rlv-td-successfully>.
- International Customer Satellites Launched. (n.d.) Retrieved from ANTRIX: <http://www.antrix.gov.in/business/international-customer-satellites-launched>.
- Kumar, N. (2012, 6) India's invisible Innovation, Retrieved from TED: [https://www.ted.com/talks/nirmalya\\_kumar\\_india\\_s\\_invisible\\_entrepreneurs/transcript?language=en](https://www.ted.com/talks/nirmalya_kumar_india_s_invisible_entrepreneurs/transcript?language=en).
- Moloney, C. (2016, 9 27) Isro Launches Record Number of Satellites in 2016, Foreign Crafts Dominate, Retrieved from *Hindustan Times*: <http://www.hindustantimes.com/india-news/isro-launches-record-number-of-satellites-in-2016-foreign-crafts-dominate/story-Y3jxVhdWafKFO0X1IEdsyl.html>
- PSLV-C37 Successfully Launches 104 Satellites in a Single Flight (2017, 02 15) Retrieved from ISRO: <http://www.isro.gov.in/update/15-feb-2017/pslv-c37-successfully-launches-104-satellites-single-flight>
- Winter, A., and Govindarajan, V. (2015, 11 04) What Engineering a Reverse Innovation Looks Like. Retrieved from *Harvard Business Review*: <https://hbr.org/2015/11/what-engineering-a-reverse-innovation-looks-like>