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A Rational Study on Strategies Adopted by the Manufacturing Engineering Firms - in Order to Protect their Core Activities while Outsourcing Engineering Design and Product Development – A Paradigm Shift.

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ABSTRACT
Rapidly changing and increasingly complex business forces are bringing dynamic shifts in management practices in any type of organisation, whether it may be a production sector or service sector. The advancing of technology, the complexity of business operations and the hunger for constant growth are conditions that require core competencies into many functional areas. This business climate demands companies to be dynamic in managing change in order to maintain their position in this competitive world. To ascertain this dynamism, Outsourcing has helped companies to focus on their core business while the day to day operations is controlled and taken care of by their outsourcing partner. This approach followed was a traditional approach to gain financial leverage and expertise knowledge. But today we can see radical change happening in outsourcing arena. The present paper focuses on outsourcing in engineering design and product development. The arguement raised in this paper is what happens when the crucial activities are outsourced in engineering design and product development whether core skills are lost which is in question. This is a review paper of many case studies which reveals that multi-national companies, which are heavily depending on these independent external agents or outsourcing partners, could see a gradual loss of design and manufacturing abilities when they outsource. So how the outsourcing process should protect these losses; in the process of writing this paper through literature survey we have ascertained that now a days', parent organizations in order to keep its product knowledge, process, techniques intact are buying stakes and becoming a partner with their outsourcing agent.

Keywords: Core activities, Independent external agents = outsourcing partner, OEM = Original Equipment Manufacturer, CM = Contract manufacturer

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I. INTRODUCTION

Outsourcing as it is seen, being practiced by many organisations since industrial revolution without necessarily calling it. In the 1800's, the beginning of industrial expansion - most of the engineering firms practiced developing their product design and development in-house therefore it took them lot of time to bring the new products into the market. They feared taking help of outside agency in this area because they perceived threats believing that their design would be copied and they might loose their product knowledge. But today outsourcing has become a paradigm shift in manufacturing practices in engineering design and product development activities. Extensive development in today's manufacturing engineering because of Information Technology, Robotics, Automation, Virtual Manufacturing and Artificial Intelligence has made revolutionary change in way the products are being manufactured and marketed. This environment has created a depression for multi-national companies to anticipate the changing dynamism of the market due to shorter product lifecycles, continuous pressure on costs, global demand and supply, societal pressure of corporate social responsibilities. As a result of this, companies in order to survive and sustain their growth are outsourcing their activities to the external suppliers to achieve competitive advantage and business excellence. According to Rothery, Ian (1996) to understand outsourcing is always knowledgeable to weigh it in the light of two management decisions that is to make the product/service in-house or to buy it. Both of these are very vital to the outsourcing decisions. No single industry has all the capabilities to produce a product or service in house on its own. Therefore in order to develop its product and services it has to look for an outside supplier. Further as the pace of the technology and communication is accelerating, and as the world is

shrinking in space, has led many businesses around the world to break their barriers and move across their boundaries for investments and search for new markets. This importance has led the organisations to think differently and build strategic partnerships with the external suppliers in order to keep its core activities intact. **'***With this trend on many companies are introducing products and opening markets around the world almost simultaneously. There is no longer an extended period during which you can grow your expertise in one market, then move into others at a future time to extend the life of your product line. That means it is much harder to own a lucrative market niche by yourself for any significant period of time.***'** [1] In pursuit of engineering design and development, utmost consideration should be taken in formulating a comprehensive product plan and strategy which can result in good business value and at the same time protecting the core activities of the Parent firm. If the core design is not protected the external supplier (outsourcing partner) may lead to easy transfer of technical knowhow and the process ideas of the product to others or he may become your competitor too. It is a kind of a double edged sword. Furthermore, in HBR, Arunnada and Vazquez (2006) writes that, it is well known fact that a contract manufacturing or an outsourcing partner is privy to an (OEM) original equipment manufacturers' intellectual property (IP), which it can disclose to other clients. And it may also happen that if some outsourcing partner in its entirety having manufactured an OEM's product, it may well decide to build its own brand and weld its own relationships with retailers and distributors when such things happen, the OEM may find itself facing dangerous incumbents and also competitors of a new kind. Thus it is very crucial to understand how this relationship works out. Few researchers like Quinn and Hilmer (1994), Kger (1998) reveals outsourcing can generate these risks such as losing some of critical skills. By this we can infer that we can loose some critical skills (some competencies) when we rely on the outsourcing partner. Looking into these risks we can see there is an evolutionary change in the adoption of outsourcing practices. Earlier organizations reviewed outsourcing decisions as a way to meet financial objectives. Now it is more than that because if core-skills are at stake than the organization is at high risk. This is what reflects with engineering design and product development when it is outsourced to an external agent. As a result, the decision to outsource has to be more strategic. All these factors call to know how the process of outsourcing works and what will be the strategies the companies may apply in order to keep their skills intact and at the same time achieve excellence in their businesses.

The main objective of this paper is:
a) To envisage how design and manufacturing arena is changing radically and whether we could see a paradigm shift happening in manufacturing practices in engineering design and product development in order to protect their core activities while outsourcing.
b) To determine strategies adopted to protect core competencies.

II. LITERATURE REVIEW

It is important to write this paper on this topic because there is no much information available in this area. Research conducted for Wind River by McKinsey & Co. (2002) on 'Strategic outsourcing of design and development' reveals that outsourcing is becoming more and more important today as part of a business strategy than it was seen before. The primary reason for this is the changes that have taken place in the business environment over the last decade. Furthermore, in this report Maurice Greaver of Strategic Outsourcing (AMAC Publishing), says, there is convergence of number of forces which include **'***competitive pressures of the global economy, Fast-changing technologies and niche competitors that can change industries overnight and Institutional investors who demand a focused management that delivers bottom-line results, adding to shareholder value.***'**[2]

In one of the report generated by the Ernst and Young (2003), in outsourcing, states that: traditionally outsourcing was primarily been used as a simple tool to achieve once-off cost reduction or to deal with operating skills shortages. Today, Organizations around the world are looking it as a strategic management tool; its role is expanding and increasing to achieve significant transformation in their operating infrastructure.

According to Gay and Essinger (2002), today's business visionaries see **'***Industry players as small outfits staffed with minimum number required to deliver core services, interlocked with external agency providing the same types of services to many clients.***'[**3**]** This external agency is an Outsourcer. They further reveal strategic outsourcing is in a sense making once business perform better at every level by exploiting the skills of the outsourcer in getting things done at your wish. In strategic outsourcing the organizations work with not only one supplier in exploiting its expertise knowledge but also expands its supplier base in order to get

[1] Opcit Wind River Paper survey done by McKinsey & Co.(2002)

[2] Opcit Wind River Paper survey done by McKinsey & Co.(2002)

[3] Opcit Charles L gay and James Essinger (2000)

better services thus gaining an edge in competition with its rivals and achieving excellence in its business.

Furthermore, Chorfas (2003) figures out in engineering design outsourcing, as the design activities grow complex they become more sophisticated and no single tool designer team can perform all the activities in generating a best design. Therefore it needs the synergy between multi-sourced tool designers to carry on the design activity. Thus in design engineering outsourcing the design components are spread to different specialists and than their activities are pooled down to get the best design.

The surveys conducted by most of the researchers in this area of study reveals that outsourcing if rightly practiced can yield many benefits: for example in one of the surveys conducted by Shreeveport business consultancy firm, it reveals that the main benefits derived from outsourcing are: the cost benefits in obtaining the service, focusing on core activities, reduction in the manpower, increased flexibility of the business enterprise, more cash inflow, low capital investment, improved quality and services. With these benefits achieved many firms are on the verge of outsourcing most of their activity while keeping the core activity for itself.

According to Chris Hayes *et al.,* (1983), ***'****Product development and design activities are a firm's most powerful competitive weapon.****'*** **[4]** In any product, design lays the backbone of the product building. It is always vital for every department in an industry and their outsourcing partners to have a thorough understanding of the design of the product as they all are actively involved in designing or building of a product.

In the paper of 'Strategic Outsourcing of Design and Development' it is reported that *'New products from Rented Brains': **'Companies are handing off engineering work to outside firms that help them dream up automobiles, airplanes, and medical devices.'***[5] These industries are now extensively outsourcing and using these services for their engineering design and development than many people actually thought. The services provided by these outsourcers cover from small individual parts to complete subsystems. Further this trend has become a permanent way of life for many engineering firms because of the constraints faced in - ***'****Ongoing headcounts and the need to access key expertise rapidly.*'[6] This article further reveals: In the development of a mini car KA, for the European market, the project led by John Risk for Ford explains, ***'****I went outside to do the 'Ka' car in 1996 because of both time and cost. We needed the car quickly. It would have been hard to hire enough people in so little time, and the company didn't want to move people in from other important programs'*[7] John Risk outsourced and then found that the program was a success, with the Ka now selling very nicely in Europe. ***'****Richard Parry-Jones, Ford's group vice-president for design and quality sees a solid future for outside engineers****'*** [8]

Furthermore, it is seen in most sophisticated engineering projects the final product is the pooled resource of everyone that is right from the supplier (outsourcer) involvement to the clients' effort. This type of product building is more often seen in huge projects for example building of an aircraft, ships, etc. we have taken this example in the study to bring out an issue of 'trust' between the parent company and outsourcing partners on the grounds of 'sharing of core design' of the end product. It is very critical to know that the product design, the parent firm shares, has the core competence in it but for the parent firm if this design is not shared it may damage its capability to master the product's exacerbating dynamics. Another question arises out of this is: why do the parent company wants' to outsource if the design is core? Therefore at a strategic level, organizations may be losing some of its core competencies in product design in these types of projects. Therefore it is critical to understand the nature of trust the parent company may have with the outsourcer partners in such type of contract.

The example of 'Caravelle' as quoted in the Chorfas (2003) exemplifies the risks associated in licensing advanced engineering products. Chorfas talks about what if licensee becomes a competitor? In the 1960s Sud Aviation gave away the license for manufacturing one of its most successful short-to-medium range Caravelle planes to Boeing without predicting the consequences of future risks and return associated with it. Boeing till than had never produced any single Caravelle (aero plane) learned from Sud Aviation and developed it even more successful and came out with 727 and 737 series.

On the other hand Sud Aviation strangled itself into the Caravelle (aero plane) and eventually its market worn out. By looking at this it went ahead with the development and finally constructed a

[4] Opcit Paper on Managing external design professionals (2002), Pp 585.
[5] Ibid Wind River Paper survey done by McKinsey & Co.(2002) pp-3
[6] Ibid Wind River Paper survey done by McKinsey & Co.(2002) pp-3
[7] Ibid Wind River Paper survey done by McKinsey & Co.(2002) pp-3
[8] Ibid Wind River Paper survey done by McKinsey & Co.(2002) pp-3

'flying white elephant' the famous plane 'Concorde'. Eventually Sud Aviation experienced and learned the mistake it did in the past and focused strategically by coming out with an *'Integrated series of airframes which gave Boeing a run for its money.'*[9]

By inferring the above example it can be understood that how the things can go out of hand when one misjudges the future consequences. Therefore on one hand outsourcing or licensing off the activities to others will fetch you good fortune initially. But on the other hand these external agencies may master your skills in the long run. As Boeing did and manufactured the most successful planes than Sud Aviation thus closing the market for Caravelle. Further to this argument Chorfas (2003), infers that: *'In a fast moving world were new technology replaces old at furious pace, there is no alternative to taking an integrated approach and the proverbial long, hard look – including the many dangers associated to misjudging the breadth of the product line, or its expansion with out a product plan which looks away into the future.*'[10]

Arunnada and Vazquez (2006) in their review in HBR writes, IBM created the personal computer industry and Lenovo which was found in 1984 was just a distributor and an assembly plant for the equipment made by IBM and some other companies. Lenovo learnt the technical knowhow of IBM and as a distributor it was able to tap retailers eventually it took over the business of personal computer of IBM and affixed its own logo to the PCs. Later, IBM and other companies learnt that contract manufacturing is a two-edged sword. Furthermore they write, while outsourcing the entirety of product manufacturing - allows (OEMs) to reduce labor costs, free up capital, and improve worker productivity. But on the other hand this evolving situation for contract manufacturing is a boon because it encourages them to develop their own brands. As contract manufacturers (CMs) reach economies of scale in manufacturing their cost levels converge and at the same time, the products made by them begin to commoditize. In responding to this, CMs will eventually gains a sustainable competitive advantage by undertaking the value-adding activities that the original manufacturers had handled themselves, such as R&D and marketing. By doing so, CMs gain room to develop their capabilities and may later use to threaten the OEMs. At this point, the CMs will have become OEMs by themselves. *'Lenovo and China-based contract manufacturers Haier (household appliances) and TCL (televisions) have become three of the world's leading companies in their industries in just this way'*[11]

Furthermore, in the same HBR Arunnada and Vazquez (2006) exemplifies there are two interesting varieties of short-term agreement. In a case of Elamex, a contract manufacturer of electronic components, lets its customers choose either a turnkey contract or a shelter agreement. In the turnkey contract, an Elamex customer shares the assembly line with other customers. Each of them pays Elamex according to the number of units produced by them. In the shelter agreement, a portion of the plant is dedicated for producing a given customer's products and here the customer pays overhead charges proportional to its share and at times even bringing its own managers to oversee the processes.

According to Bruce Margaret and Barny Morris (1994), in their case studies built on British manufacturing companies in 'Managing external design' provides a classification of different approaches to design management and its issues. They interviewed eight companies in different fields of engineering design, for example White goods, the electrical company, the medical instruments company and so on. The authors concluded that: Outsourcing design expertise will be an obvious trend and it is going to stay no matter whether one can see its benefits and dis-benefits of producing in-house or out-house. The main issues the authors found concerning outsourcing are those of 'accessibility', 'familiarity' and 'control'. Bruce Margaret and Barny Morris further concludes that outsourcing can guide the organizations to new insights and refined designs at a cheap cost if and only if the whole process of outsourcing is well managed and the client company is certain of a positive outcome.

In the paper of 'Strategic Outsourcing of Design and Development' the authors find the most important drivers that directly influence the design and development that makes an utmost impact: *'Time to profitability, Product robustness and reliability, Product feature set, Controlled costs, Optimal use of resources (people, technology, space)'*[12] According to (Nevins *et al.*, 1989; Sullivan 1987; Susman, 1992), if one can creatively design the product by using fewer parts, using less expensive materials, developing intricate shapes that are easier to design and manufacture can bring down manufacturing cost substantially and even quality benefits are realized. The authors further argue that in order to achieve these benefits at the

[9] Ibid 'Out sourcing in-sourcing and IT for enterprise management' Chorfas (2003), (Pp.123 – 124)
[10] Ibid 'Out sourcing in-sourcing and IT for enterprise management' Chorfas (2003), (Pp.123 – 124)
[11] Opcit https://hbr.org/2006/09/when-your-contract-manufacturer-becomes-your-competitor
[12] Opcit Wind River Paper survey done by McKinsey & Co.(2002) pp-3

early stages one has to involve Supplier during the early stages of product design and development, which will enable the manufacturer to gain benefits as, stated earlier.

In the research paper of *'Outsourcing a Paradigm Shift' by Nada Kakabadse, Andrew Kakabadse according to Venkatraman (1997) reveals that: **'**As organizations redirect valuable internal skills and capabilities to high value added activities, the sourcing debate has moved from whether to outsource, to what and how to outsource.**'*** [13] The findings of this research paper suggest that this debate is on and on and steadily moving up the organization at the top level officials right from the CIO (chief information officer), CFO (chief financial officer) and CEO (chief executive officer), with all the sensitive issues still yet to be resolved and as such to what, and what not, to outsource is still the question. According to Prahalad and Hamel (1990), Bettis et al (1992), Lacity et al. (1995), Quinn and Hilmer (1994), Rothery and Robertson (1995), Kelley (1995),

Peisch (1995), Mullin (1996), many scholars have accepted the 'strategic perspective' and many practitioners have accepted 'conventional wisdom' claiming that core activities should stay in-house, while non-core activities can be outsourced, in order to protect core competencies. However, Quinn and Hilmer (1994), defines the core competency for any one organization is weighed down with many different views. Some consider core activities as core competencies; explicitly those key-activities that the firms continuously engage in, while marginal activities are periodic and therefore can be outsourced. Some scholar further claims along the lines of Porter's (1990) competitive advantage' further supported by Prahalad and Hamel (1990), Quinn and Hilmer (1994), reveals that *'core competencies are those activities that offer long-term competitive advantage and thus must be kept in-house.'*[14] Exemplify by Sony's capacity to miniaturize components and Philips' optical media expertise and applications. This infers many views on outsourcing only the peripheral activities while protecting the firms' core-competencies.

In engineering design service outsourcing it is rather difficult for the client firm to maintain their competencies when they are depending upon the outside expertise for the design of a product. In the paper of 'Strategic Outsourcing of Design and Development' The authors further states that: *'Almost every good vendor has worked for numerous clients and the odds are high that some of them are your competitors. You cannot betray the trust of other companies; however, you can hope the vendor has developed some expertise from these engagements that provide new view points and technical approaches that will cross fertilize your internal efforts.*'[15] Furthermore, in this relationship the authors reveal that there has to be a *'Continuing, in-depth sharing of technical details and project plans.'* [16]

III. CONCLUSION

Determining the outsourcing decision in 'Engineering Design and Product Development' is a highly paramount issue for sustainable development. Organizations, especially at the top management, should recognize core capabilities of their firm and their due importance for the sustainability of their organization for long term. They need to analyze lot of qualitative criterions' like the good-will, the trust, the agreements, and the Intellectual property risk to protect skills of their firm with its outsourcing partner in order to achieve and improve the sustainability of their organizations.

With reference to the objectives in this study, literature review has allowed us to form more valuable conclusion. Outsourcing in recent past was principally been used as a simple tool to achieve once-off cost reduction or to deal with operating skills shortages but today Organizations around the world are looking it as a strategic management tool. In outsourcing of engineering design services – on one hand when a parent company outsources it exploits the outsourcers' skills and expertise knowledge and on the other hand it looses its original idea which it had developed since long. For both the parent company and the outsourcer it's a game wherein both exploit each others' resources in order to get out the best product out in the market in order to achieve excellence in its business. But the parent company may be at risk by loosing its core ideas. Here in this paper, the views of many scholars seen in literature review always highlight on outsourcing peripheral activities while maintaining the core activities for itself. But in outsourcing 'Engineering Design and Product Development', because design and manufacturing is the pooled resources of both parent firm and the outsourcing partner there is no secrecy left. Therefore to protect the core skills (core activities) now a days the strategies adopted by the companies are, they are buying stakes of their outsourcing firm. In the Avendus sector report in engineering design, it reveals that the companies, which want to maintain

[13] Ibid Kakabadse Nada, Kakabadse Andrew.,2000, 'Critical review - Outsourcing: a paradigm shift'
[14] Ibid Kakabadse Nada, Kakabadse Andrew.,2000, 'Critical review - Outsourcing: a paradigm shift' pp-674
[15] Ibid Wind River Paper survey done by McKinsey & Co.(2002) pp-3
[16] Ibid Wind River Paper survey done by McKinsey & Co.(2002) pp-3

adequate control over the outsourced design process, are now buying up some stakes in those companies whom they outsource with. For example, *'Pratt and Whitney who outsource design of air craft components to InfoTech enterprise have taken up an 18% in the company.'*[17] This has enabled the firms to protect their internal skills and techniques in tact when they outsource. Furthermore, though parent organisation is buying stakes but still the company's ownership of capabilities of its outsourcing partner is not a matter of much concern rather its ability to control and make the most of critical capabilities of outsourcing firm is paramount. Thus we can see a radical change and paradigm shift happening in manufacturing practices in engineering design and product development activities.

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