

Extended Engineering



A New Perspective on Offshore Product Engineering

Globalization has changed the way enterprises function; customers occupy the center stage of business. Product lifecycles have become shorter as customers started demanding quality products in quick time. Creating a new, customized product every time is a tedious task, often money and time consuming. This problem can be overcome if enterprises enhance the existing products further to explore developing new markets. Developing a new product from the existing one or adding new features to the existing one should not necessarily happen within the enterprise itself. All these processes can be shared and developed through extended engineering, through a single or more business partners.

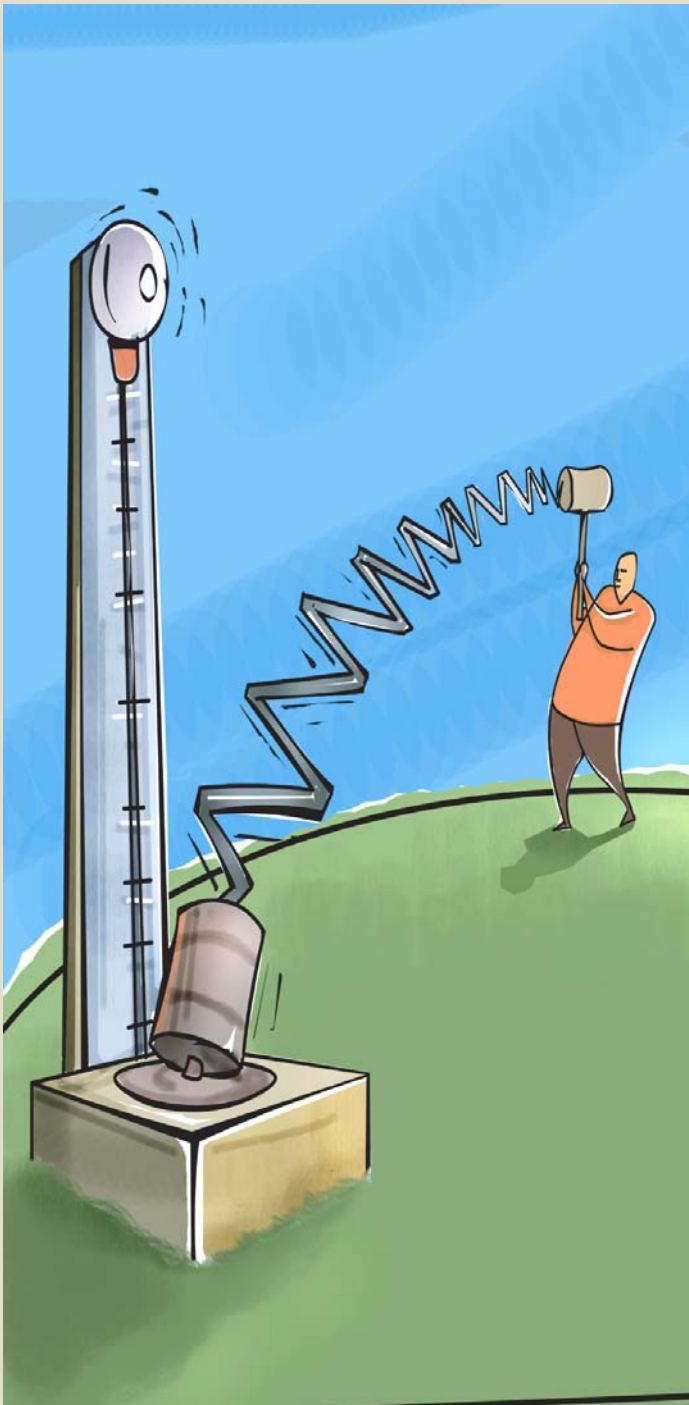


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Introduction

As economy boomed in the 90s technology companies went on an innovation binge, poured money into new programs, generating new ideas, pioneering new technologies and promoting creativity amongst employees. But as the economy dipped, companies quickly cut the flow of funds into innovation efforts. Many an idea is trapped within individual companies for lack of will to take the idea to fruition or the compulsions of economics to support the same.

Advances in information technology have made it easier for companies to exchange data and coordinate activities. This has given rise to a new vision of a corporate organization - one in which individual companies outsource many of their activities to an array of partners.

The 90s saw the boom in outsourcing in a variety of areas, mainly in IT services followed by Infrastructure Outsourcing. With the outsourcing model maturing, the recent wave has been in the area of Business Process Outsourcing, where companies have become bolder and have outsourced their critical applications.

Meanwhile a silent revolution has been going on in Product Design & Engineering Outsourcing. This was mainly fueled by technology product companies taking advantage of a rich technical pool of engineers with a definite cost arbitrage. But as the revolution progressed, the R&D outsourcing has seen refinements and developed into a key element in a company's strategy.

This paper articulates the 'Extended engineering' paradigm and the benefits of such a model.

The Innovation Impulse

The heightened pace of change and recent dramatic market developments have made innovation efforts top priority for many leading companies. Innovations and the way these innovations are marketed can change the fortunes of an enterprise. Prof. Henry Chesbrough of Berkeley in his research paper 'The Era of Open Innovation' mentions that internal R&D is no longer the asset it once was. There is a fundamental shift in how companies generate new ideas and bring them to market. In the old model of 'Closed Innovation', companies must generate their own ideas which they then, design, develop, manufacture, market, distribute and service themselves.

In contrast to this, Chesbrough talks about the 'Open Innovation Model' (Figure 1) where a company commercializes its own ideas, as well as innovations from other firms, and seeks ways to bring its in-house ideas to market by developing pathways outside its current business.

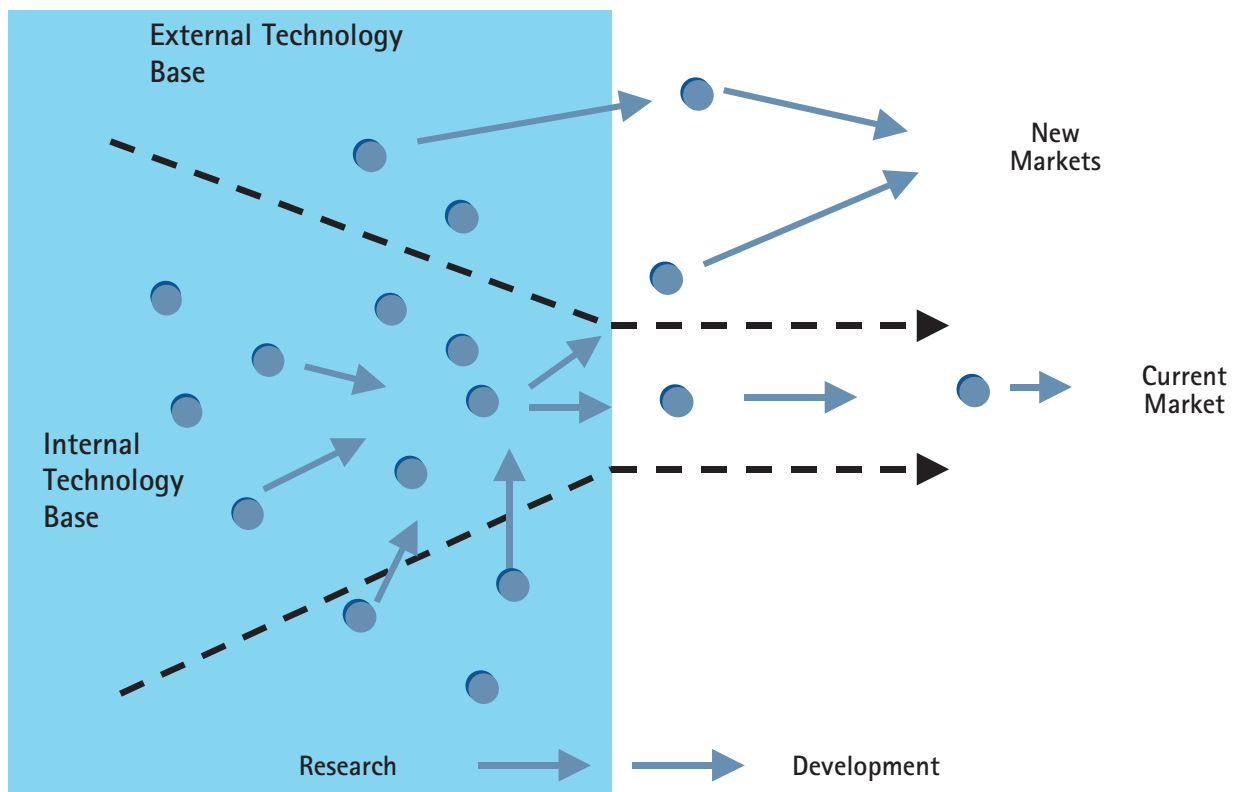


Figure 1: The Open Innovation Model

Hence the locus of innovation has moved beyond the confines of the central R&D organization and is now situated amongst the product-engineering partners, various start-ups, universities and research consortia.

In his seminal paper, Chesbrough draws comparison between, Xerox and Cisco. Xerox in its PARC labs invented the Ethernet and the GUI. However these inventions were not viewed as potential business for Xerox, which was focused on high-speed copiers and printers. Hence they languished inside PARC only to be commercialized by other companies. Cisco on the other hand adopted a different strategy, whatever technology the company needed; it acquired them from outside usually by partnering with outside companies or by investing in start-ups.

This model is now being effectively used by major technology companies by working with partners during the engineering phase of the product. According to a NASSCOM/McKinsey survey, in India alone, the R&D services market is poised to grow to \$11 B by the year 2008.

In some ways this trend today is similar to what happened in the eighties to manufacturing in the electronics industry. Unified logistics spawned a new industry in Taiwan and APAC, as technology product companies transferred their manufacturing operations to Electronic Manufacturing Service (EMS) companies.

Technology Product Value Chain

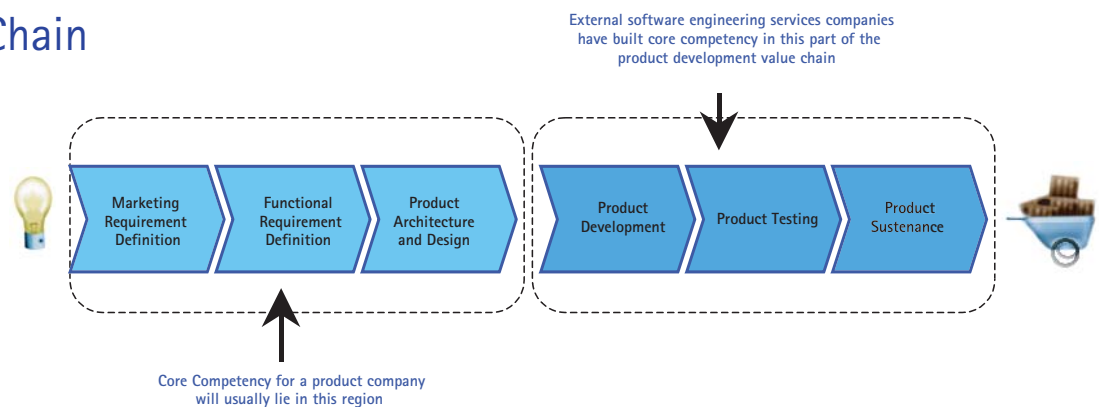


Figure 2: Product development value chain

Companies today need to focus on their core competence, i.e. listen to their customers, and ideate new products. The development of these products and the maintenance of the products can be outsourced to service partners.

In their search for external sources of technology, the firms will adopt flexibility - demanded by the rapidly changing economy and conditioned by the scarcity of production factors - an overriding principle of outsourcing. Flexibility is one of the traits of a company's organizational innovativeness, at the same time it complements technological innovation within the firm. Extended engineering is the way to the future and a strategic business imperative to the technology product company.

Extended Engineering

Extended engineering is a paradigm being rapidly adopted for leveraging R&D investment and accessing new knowledge and experience across the globe. It provides global access to knowledge, people and technical infrastructure, enabling the firm to focus on its core competencies.

The transformation of ideas into assets is the core responsibility of R&D. In the IT services market, this includes intangibles such as process optimization and tangible creations such as repeatable services, toolsets and methodologies.

While the 'R' (Research) in R&D (Research & Development) is a domain of the company, the 'D' (Development) phase of R&D is where the emergence of partners enable product companies to redeploy talent and capital resources any time a market change occurs.

Extended engineering is the concept where technology product companies:

- Extend the product design and development phase to service partners
- Collaborate to capture the best practices in design and development on both sides
- Leverage the key development strengths of the partners to get the product faster to the market
- Leverage the global model to provide product sustenance and generate derivative products, thus extending the lifecycle of the product
- Provide cost effective remote technical product support while retaining customer experience (Refer Figure 2)

The drivers of extended engineering are:

- Globalization of markets
- Shortage of people and capital
- Faster time-to-market
- Dis-aggregation in the product lifecycle
- Multiple designs centers
- Increased technology sophistication and software components in devices
- Increasing product engineering cost

Processes Involved in Extended Engineering

Figure 3 depicts the phases and the activities involved in various stages of the product development value chain.

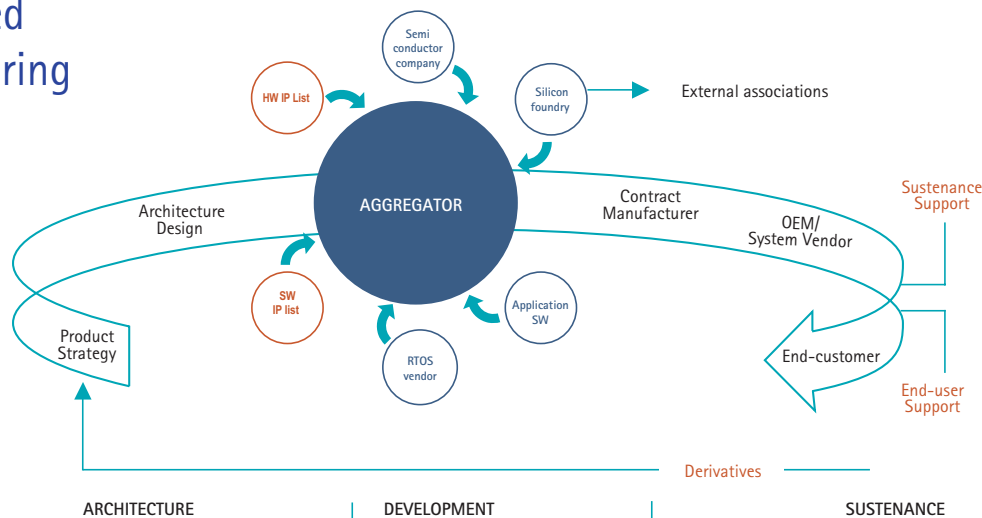


Figure 3: Stages of product development value chain

Product Strategy

Comprehensive planning can solve the complicated challenges of developing a coherent product strategy in uncertain market conditions. Proper product strategy ensures effective management of channel conflict, increasing product engineering collaboration & productivity, cost reduction & operation efficiency, customer connections and strategic change management.

Product strategy stage involves the following:

- Business value analysis
- Market mapping
- Competitive analysis
- Future mapping
- Business planning

Product Architecture Phase

Initially a product is conceptualized in the R&D labs. Here the design and product specifications are defined. In this phase, most companies may not want to include a third party service partner. But it's seen that many start-ups and niche technology companies do involve partners at this stage.

The following are the types of activities that can be outsourced in this stage:

- System architecture view
- Performance analysis
- Time-to-silicon consideration
- Component selection
- IP selection and qualification

Design & Development Phase

During this phase, the product goes through the hardware phase cycle where, there may be a need to develop a h/w Intellectual Property (IP) block, integrate third party IP and develop a semiconductor chip. Further it's required to integrate the silicon and build a working system.

The software cycle involves an s/w IP, a real time operating system and an application software on top of that.

All of these components may be provided by different vendors and the company would need to spend enormous efforts to integrate all of these into one contiguous unit. After this, the contract manufacturer produces the volume and the product reaches the market.

Sustenance Support Phase

Once the product gets to market it would require engineering support in the form of bug fixes, patches upgrades etc. Sustenance phase involves:

- Product testing, migration & test planning
- Current engineering, modeling & design, black/white box testing
- Sustenance bug fixing & configuration management
- Technical support - problem escalation, trouble shooting
- Inbound & outbound support

The most critical aspect of this phase is developing derivative products. Often these derivative products have to go back to the design phase, and its here that the extended engineering partner brings immense value. The customer can outsource the entire redesign and development of the derivative product to the partner, who knows the engineering of the product. This gives rise to sustaining an existing product and generating a positive revenue stream.

The Role of the Aggregator

With products defining the identity of technology companies, the current business environment is looking to adopt innovative ways to turn ideas into real products - really quick. Also, the complexities in technology and the advancement in chip technology have created increasing dis-aggregation in the industry. This has given rise to the role of an 'aggregator' in product lifecycle value chain.

The 'aggregator' within the extended engineering paradigm offers two key benefits:

- Since the aggregator works with each of the components of the value chain, he would know the nuances of each component. As a result he would be able to integrate each of the components, thus gaining faster time-to-market. For example, aggregator has its own IPs, works with semiconductor companies and RTOS vendors and other IP vendors. By this the aggregator would know for each, the performance, usage patterns of each component and would be the best suited to recommend and integrate any of these products.
- Market visibility - The aggregator knows the market demands of each of the components and hence can provide valuable customer insight in the engineering phase of the product.

The Extended Engineering Advantage

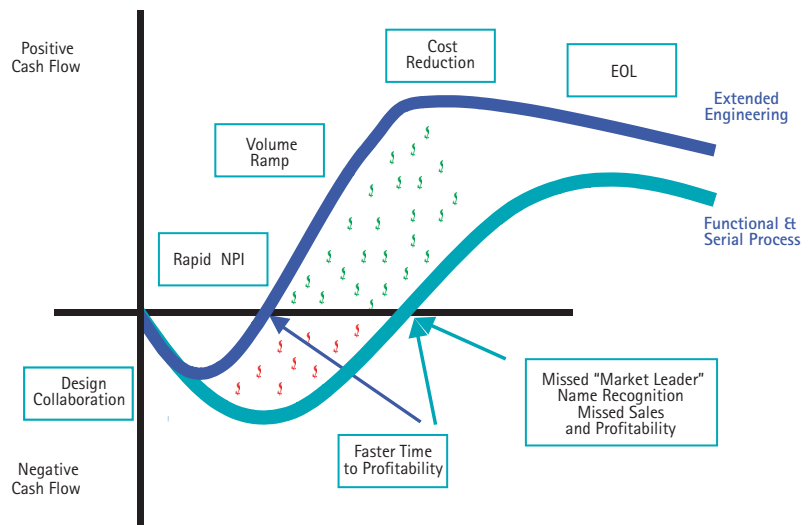


Figure 4: New Product Introduction

When companies decided to bring out new products, they adopt either a functional and serial process by utilizing their own R&D and their own methodology.

Under this they miss the market leader name recognition. They may lose sales and profitability by introducing the new product much later as against their competition as depicted in Figure 4.

In the Extended Engineering Model, using the expertise of the service partner, the enterprise can introduce new products faster. It can guarantee the enterprise of positive cash flow while ensuring market leadership.

The Extended Engineering Model helps companies to:

- Realize new product products faster
- Globalize existing products for new markets
- Maintain existing products with better cost efficiencies

Conclusion

Wipro has evolved an Extended Engineering Model based on the experience it has evolved while working on part 'D' (Development) of R&D for leading technology product companies.

By doing over 500 projects in a year, conforming to development practices, Wipro is able to pass the 'Development Edge' to our customers. Going forward apart from cost arbitrage, this could be a key sustainable value proposition for our customers.

With more than 20 years experience, Wipro is the largest 'true' third party R&D Services provider in the world with revenues of over \$270 million employing over 6500 engineers. Wipro works with nine of the top-ten telecom equipment providers along with the leading technology product companies. Wipro has proven expertise in the areas of computing systems & peripherals, storage, consumer electronics and automotive electronics.

Wipro Technologies is best suited to play the role of the aggregator in this Extended Engineering Model as it has the expertise and the experience at each of the component layers as well as with each of the phases.

References

'The Era of Open Innovation', Henry Chesbrough, Sloan Management Review, Vol: 44, #3 (Spring) 2003, pages 35-41

About the Author

Sachin Mulay is an MBA in Marketing and has over 14 years of experience in software product and services marketing. Sachin has worked for Microsoft and Oracle in India apart from a stint in Business Development in Singapore. He is currently the Strategic Marketing Manager for the Embedded & Product Engineering Group at Wipro Technologies.

About Wipro Technologies

Wipro is the first PCMM Level 5 and SEI CMMi Level 5 certified IT Services Company globally. Wipro provides comprehensive IT solutions and services (including systems integration, IS outsourcing, package implementation, software application development and maintenance) and Research & Development services (hardware and software design, development and implementation) to corporations globally.

Wipro's unique value proposition is further delivered through our pioneering Offshore Outsourcing Model and stringent Quality Processes of SEI and Six Sigma.

Wipro in R&D Services

Wipro Technology offers world-class technology solutions for the telecom and the embedded & product engineering industry. Wipro has successfully executed several projects spanning product strategy, product design & development and product sustenance & Support. We address the telecom – broadband, wireless and voice – automotive electronics, consumer electronics, mobile devices & applications, computing systems & Peripherals, storage and industrial automation.

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