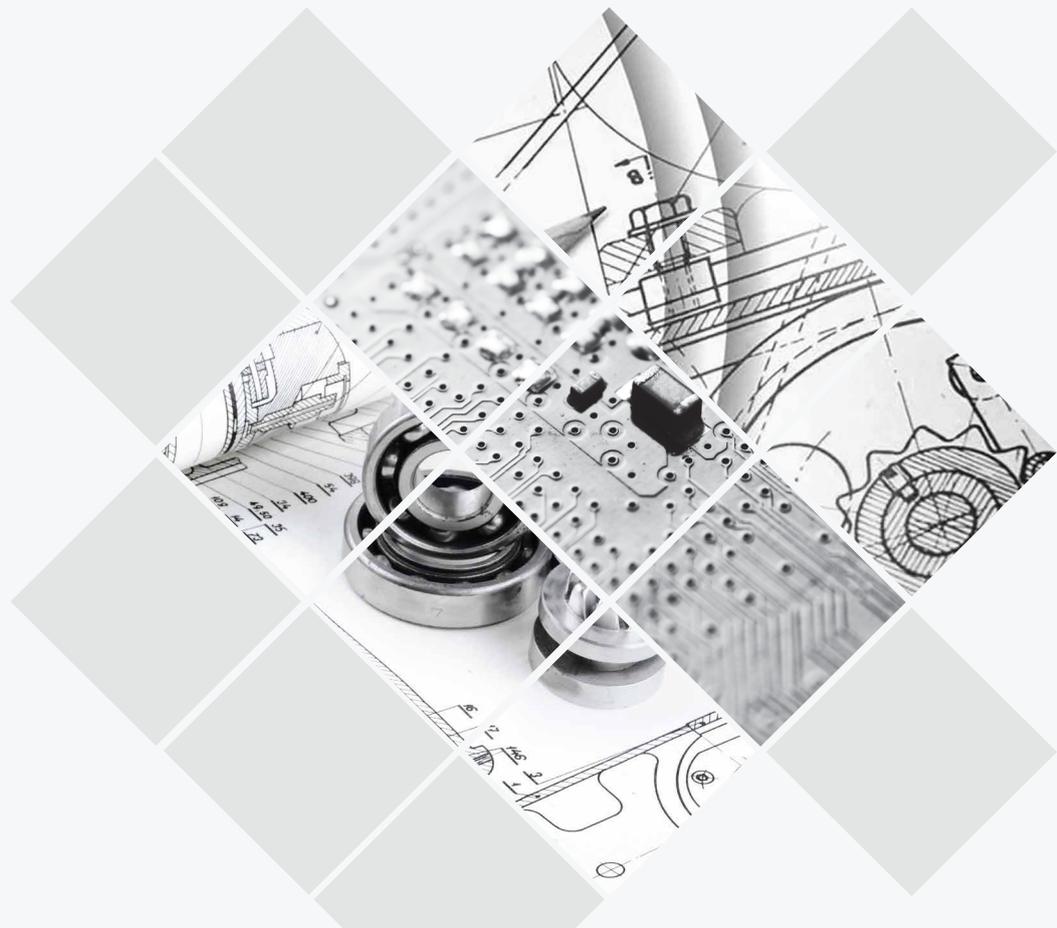


innovation in engineering services outsourcing: the need, challenges and way forward

This paper gives an overview of the need for innovation in Engineering Service Outsourcing (ESO) companies, the challenges faced and the way forward.



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Abstract

This paper gives an overview of the need for innovation in Engineering Service Outsourcing (ESO) companies, the challenges faced and the way forward. Starting with a background of the outsourcing landscape, the evolving needs of the market/customers are detailed. A comparison of engineering services with the IT/BPO industry helps us draw parallels between drivers of these industries. The challenges faced by the services industry and some solutions to overcome these challenges are

discussed. Implementation of change in an organization (to adapt to the evolving needs of the market) is a difficult task. The success of the productivity initiative in QuEST is used as an example to demonstrate the steps to be followed to implement such changes.

Keywords: Innovation, outsourcing, process, automation, Six Sigma, Knowledge Based Engineering, Intellectual Property

Background

The last two decades have witnessed the birth and boom of outsourcing from high cost countries to low cost countries – driven primarily by cost pressures. The Information Technology (IT) sector led the way into an industry spanning several verticals and geographies. A similar trend was witnessed in the Business Process Outsourcing (BPO) sector (call centres, backend office transaction processing, etc). Engineering Services Outsourcing (ESO) saw the growth in the mid 90's led by the automotive industry. The early part of the 21st century saw economic turmoil caused by the dot com burst, 9/11 and recession in US/Europe (Ref 1). These events not only forced companies to rethink their spending on product development but also drove them to look at newer markets (especially emerging countries like Brazil, Russia, India, China (BRIC)) to sustain their growth. The growth in BRIC was driven by free trade, a growing middle class (consumers) and their needs in appliances, cars, travel by air and so on (Ref 2). Offset clauses also forced the Original Equipment Manufacturers (OEM) to invest in these countries. Other

factors that drove outsourcing included the changing demographics in the US/Europe (ageing population, preference of younger generation to take up non-engineering disciplines, etc). Engineering outsourcing started in the mid 90's with automotive companies outsourcing low end task based work to offshore. Such work was well defined, scalable and repeatable – thus an attractive option to outsource. A similar trend was seen in consumer goods and industrial appliances. Compared to the automotive or industrial domain, the aerospace domain was a slow starter. One of the reasons for a slow start was that the industry was far more regulated than the others because of the critical safety requirements. However, the cost pressures started driving them towards outsourcing too. After this, the industry opened up and India became a default destination for engineering outsourcing. While QuEST had been in business since 1997, the first aerospace customer was acquired in 2004 and today has more than 50% of its revenue from this sector.

The Need for Innovation

With outsourcing and offshoring becoming an integral part of the business, the nature of outsourcing also started evolving. Deals became larger, offshore development centers with several hundred engineers were the norm, IT systems and data access were well established and so on and so forth. But the work done was typically low end data conversion, modelling and drafting, low end analysis, technical documentation, etc., (Ref 3). As more work got outsourced, more suppliers

emerged and the work started getting commoitized. Abundant capacity and capability led to a price war. The period after the recession in 2008 saw a step change in outsourcing.

Customers now wanted to send larger portions of their work offshore – this meant that the complexity of the work increased. Capability



became important. Customers wanted their suppliers to take more ownership of the product lifecycle. Both these factors – cost & ownership pressure opened up the Indian IT companies to the reality of need for innovation.

It must be mentioned that while the need for innovation was first felt in the IT/BPO sector, it has percolated into the ESO sector too.

Innovation in Product vs Service Companies

Innovation happens when an idea is implemented to create an impact. It has three elements: idea, implementation and impact. The impact is typically measured as either cost saving or an increase in revenue – both resulting in higher profits (Ref 4).

Innovation in product companies (or OEM) is well understood and practiced. They have well established processes, funding/budgets, development methods and metrics to measure the success of their innovations. Names like Apple, 3M, Toyota, General Electric, etc., quickly come to one's mind when talking about innovation.

The above definition of innovation is appropriate for service companies too. As these companies don't own the product or any of the Intellectual Property, replicating a system similar to their customers doesn't make logic or financial benefit. As service companies essentially processed information on behalf of their customers, the innovation journey has been essentially around the process.

A summary of the findings of innovation in the IT/BPO industry (Ref 3) refers to three types of innovation:

- a) New products/services/solutions
- b) New processes
- c) New business models

Most of the innovations have been centred around the introduction and/or modification of new processes. Large companies like Cognizant have introduced concepts like “Two in a box” and in-house products like C2.0, which help them to be more efficient and serve the customer in a better way (Ref 5). Other companies like Infosys/TCS have taken the route of introducing new products and also patenting certain technologies or processes that help them to differentiate from their competition. While Infosys has filed for over 500 patents (Ref 5), TCS has filed for more than 1000 patents (Ref 6).

In summary, it is evident that the IT/BPO industry has recognized the need and has been attempting to innovate and monetize (with reasonable success) over the last five years. A very similar need has now begun to emerge in the ESO space and the next section discusses some of the ways the industry can respond to the needs.

Challenges

There are several challenges faced by the ESO companies while attempting innovation.

- i) Intellectual Property – Most of the work done by ESO's is done directly for their customers on their products. Thus by default, they do not own the product. Any innovation that emerges as a result of the work carried out belongs to the customer. Thus ESO's working for multiple customers (who are competitors themselves) have to be extremely careful not to violate the IP.
- ii) Capability – Innovation requires a fair bit of product and domain knowledge. As ESO's do not work on

concept development phase of the product development lifecycle, their ability to innovate is limited. It also needs creative thinking and experimenting skills which the staff of ESO's do not normally invest in (most of their time is spent in delivering the daily work).

- iii) Funding – Innovation requires funding to convert the idea into reality. Usually, ESO's are limited by their funding because there is no clarity on the return on investment in most cases (limited by item (a) above).

In the next section, a few solutions to these challenges are presented with QuEST examples wherever available.

Solution

Before going into the details of the ways to innovate in ESO, a few solutions to the challenges raised in the previous section are first presented.

i) Intellectual Property – The way forward on dealing with this challenge is to have joint ownership of product development and patents. In cases where joint ownership is not possible, we have had instances of the inclusion of QuEST staff in the patent document. This gives a good indicator of the capability of the organization to innovate and also gives recognition to the individuals who have participated in the process. A good example of such collaboration is the patent resulting from a project in which QuEST supported our customer (Ref 8).

ii) Capability – Developing product knowledge is not easy especially in ESO where the supplier is not close to the product development. QuEST has taken the route of “Local-Global” model in which there are teams comprising of very experienced engineers (many of them recruited from the customer) called “Local” who form the guiding force for the rest of the team called “Global”. In this model, it is a win-win situation for the customer as well as QuEST because the customer gets someone who understands their needs and QuEST gets to play a bigger role and add value to the customer. QuEST has also started training small teams in creativity.

iii) Funding – The solution to this lies in the ESO making strategic investments in areas where they believe the customer would have a need in the future. QuEST works very closely with its strategic customers to identify such needs (through technology road mapping) and makes small investments to grow a capability or develop a new offering, which could be innovative.

By combining the above, the ESO companies can take the following steps to grow up the value chain through innovation.

LEAN/Six Sigma

Most companies start their journey on process improvements through LEAN/Six Sigma. This is a time tested method and has been adopted across all sectors. At QuEST, we started the journey in 2006-07. The Six Sigma concept brought rigour in terms of project definition, setting clear goals/metrics to measure success and executing the project in a disciplined manner. The Six Sigma concept helped to solve many

systemic issues and eliminate them from a process standpoint. The LEAN concepts are more recent in QuEST and have been used to help reduce waste in our processes. Both these techniques have helped QuEST to improve the efficiency of processes in general.

Automation/KBE

Automation and Knowledge Based Engineering (KBE) is the next route that could be taken by ESO companies to differentiate and innovate. The key feature of Automation is to automate repeated or time consuming manual tasks with the help of scripts, programs and methods so that the manual element is replaced through electronic means. In engineering work, there is always a good scope to introduce automation. A lot of the engineering calculations can be automated; tools can be connected to exchange information (egs. CAD systems can be connected with Simulation systems) and speed up the process of execution.

The key benefits of automation are :

- Reduces manual work and the associated time (at QuEST we have seen reduction in effort up to 90%)
- Reduces the possibility of errors and associate rework (at QuEST we have seen 100% reduction in defects in certain areas and 5-7% reduction in rework hours)
- Allows the engineer to do other value added tasks (helps engineer to focus more on the engineering aspects, results interpretation rather than execution)
- Allows the possibility of using a lesser experienced engineer (activities that earlier required experience can be automated and thus deskill the work. At QuEST, we have had good results with this and in most cases passed on the cost benefit to our customers)

KBE on the other hand is a more advanced form of automation. It incorporates various rules in a process and helps the quicker completion of the process because of the in-built knowledge base. KBE is a technology that deals with the capture of knowledge of engineering processes in a software environment. It captures the ‘how’ and ‘why’ of a design process. This allows automated analysis of inputs and generation of engineering solutions (Ref 9).

KBE has grown significantly in the engineering space because of the inherent rule based technologies. At QuEST, we have used KBE to innovate for our customers. We have built several systems which not only accelerate the design process but also offer alternate design solutions. Such systems take the burden off the customer engineer and give them free time to spend on new product initiatives, evaluate multiple designs, etc.. Another key feature of KBE systems is that it retains knowledge and also transforms them to appropriate rules wherever applicable.

Productivity Improvement

The emergence of competition (resulting in lower bill rates) as well as rising operational costs (wage, infrastructure, overheads) have put tremendous pressure on the margins of ESO companies. A popular method to retain/improve margins as well as to beat the competition is to improve productivity. Productivity initiatives are driven to reduce time taken to complete a task or the number of people required to perform a task. While they are essentially a combination of process improvement and/or automation, this forms the stepping stone for innovation in the organization. As productivity initiatives are not restricted to specific individuals or teams, the success depends on the culture that is built in the organization.

At QuEST, we launched the Operations Productivity Improvement Initiative in September 2012. The major difference from earlier drives were:

- Open to engineers across all bands (earlier restricted to supervisory and above)
- Creation of an ideas portal (allows anyone to submit an idea anytime)
- Appreciate ideas (formation of PI Leaders in different centers who would assist the submitter to elaborate the idea and submit to the council)
- API council comprising of members from all geographies who evaluate the idea and recommend/reject it for funding
- A funding mechanism to support the development of the idea (earlier we just left it to the individual to pursue the idea and not many did it for lack of funding)
- A formal mechanism to implement the idea and track the benefits

Starting from a few ideas per week, we now get about 30-40 ideas per week across the globe. Over 100 of

these ideas have been funded and close to 40 of them have already been implemented resulting in savings of several hundred thousand dollars to our customers and ourselves.

The culture of sharing ideas, the process of evaluating them, funding them and bringing them to fruition are the building blocks to the next step of innovation. At QuEST, we believe that the culture needs to be incorporated first and the results would follow. We followed Kotter's 8-steps for creating this change (Ref 10):

a) **Establish a sense of urgency** - The top leadership of the delivery units was convinced about the need and their second lines needed some clear messaging/data to be convinced. We had to shake people out of their comfort zones to be creative.

b) **Form a powerful guiding coalition** - The next step in the productivity initiative was to form a team of productivity leaders who were drawn from the delivery teams. These members were senior folks who had the passion and drive to lead the change within their operating units. These leaders had themselves led large teams and could easily collaborate with each other despite cultural diversity.

c) **Create a vision** - The head of delivery presented his vision to a senior audience and conveyed what he wanted to achieve out of the initiative. This crisp presentation still is the backbone of all our efforts on this initiative.

d) **Communicate the vision** - Several methods of communication were used starting with specific mailers, articles in our newsletters, direct communication from top to bottom, targeted campaigns with teasers, forums on the intranet and so on. The productivity leaders talked to several team leads/engineers and explained the vision.

e) **Empower others to act on the vision** - The productivity leaders in turn identified certain champions within their centers who helped the leaders to drive the vision. Engineers who submitted ideas were personally thanked, each and every idea submitted was treated although there was never a better idea, ideas not belonging to a department were forwarded to others to take action (and tracked to closure). Employees were encouraged to share without fear, to share without prejudice and this saw a huge traction in employee engagement.



f) **Plan for and create short term wins** - At the beginning, we only focused on whether the message was going down to the last engineer or not. The key success was measured by the number of ideas submitted by execution level engineers. While the ideas could have been better in terms of quality, the numbers didn't disappoint us and our first wins were measured by these metrics. We also publicly acknowledged those who actively contributed to these ideas and set a sort of competition amongst the different centers. This being done, good ideas were funded into realizable projects to demonstrate success.

g) **Consolidate improvements and produce more change** – It was felt that early winners would become champions in their own areas and drive this even further. A roadshow of successes was organized to create more awareness.

h) **Institutionalize new approaches** - Productivity improvements help improve margins (profitability) for the organization. Communication of evidences to reinforce the connection between good behavior (productive engineer) and corporate success (profitability) is essential. QuEST has also linked the success of the initiative to the performance appraisal for senior managers to drive this across.

The success of the productivity initiative has made us to believe that companies like QuEST can begin their innovation journey through the same steps. The significant improvements in process that have saved several hundreds of thousands of dollars for our customers is well appreciated by the customer, is seen as a differentiator for us and opens up the mind of our

staff to believe that they can think of improvements and implement them.

At QuEST, the first step in innovation has been crossed and we believe we should have good results in the next few years. We would be closely following the guidance given (reference 4) to implement our systems, processes, metrics and output.

External Drivers

As mentioned in an earlier section, a major hurdle in encouraging innovation is the IP issue. A recent initiative by Rolls-Royce (called the Rolls-Royce Open Innovation in India) seems to be a good way to overcome the issue. Companies / individuals / universities interested in participating in the program need to register themselves further to which a set of technical challenges would be made available. The parties need to develop a proposal to address the challenge, which if selected, would be funded by Rolls-Royce and taken through to completion. Such platforms and forums are an excellent way to encourage ESO companies to innovate without the fear of IP violation.

The other advantage of ESO participating in such initiatives is that the exact needs of the OEM are addressed rather than some assumed needs. As these challenges are also funded, it is an added incentive to the ESO to participate without the fear of funding something which may not be useful. The collaborative nature of the initiative also helps more than one company to participate and hence bring out the best from one and all. QuEST is actively participating in this initiative.

Way Forward

As we go towards 2020 and beyond, the nature of outsourcing, the needs of the OEM's and the market would change a lot and drive the outsourcing from a pure cost perspective to a capability driven model. Innovation would play an important role in ensuring that the ESO companies provide value to their customers. Innovation is a big topic by nature but each company has to adapt to the needs by choosing the appropriate methods and

tools to embark on the journey. Simple improvements in process through LEAN/Six Sigma could be a good start. Automation of existing methods/processes followed by KBE would be appropriate for mid-sized companies. Building a culture of improvement requires change to be imbibed in companies. Our experience in QuEST with the productivity initiative is a successful example of bringing in organization-wide change.



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Appendix 1: Acronyms

ESO – Engineering Services Outsourcing
 IT – Information Technology
 BPO – Business Process Outsourcing
 KBE – Knowledge Based Engineering

OEM – Original Equipment Manufacturer
 BRIC – Brazil, Russia, India, China
 IP – Intellectual Property

Author Profile



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Dr TC Ramesh is a General Manager with the Technology Excellence Group at QuEST Global. He is based out of Bangalore, India and is responsible for Capability Development, Knowledge Management, Engineering Processes and Technical Solutions.

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About QuEST Global

QuEST Global is a focused global engineering solutions provider with a proven track record of over 17 years serving the product development & production engineering needs of high technology companies. A pioneer in global engineering services, QuEST is a trusted, strategic and long term partner for many Fortune 500 companies in the Aero Engines, Aerospace & Defence, Transportation, Oil & Gas, Power, Healthcare and other high tech industries. The company offers mechanical, electrical, electronics, embedded, engineering software, engineering analytics, manufacturing engineering and supply chain transformative solutions across the complete engineering lifecycle.

QuEST partners with customers to continuously create value through customer-centric culture, continuous improvement mind-set, as well as domain specific engineering capability. Through its local-global model, QuEST provides maximum value engineering interactions locally, along with high quality deliveries at optimal cost from global locations. The company comprises of more than 7,000 passionate engineers of nine different nationalities intent on making a positive impact to the business of world class customers, transforming the way they do engineering.



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