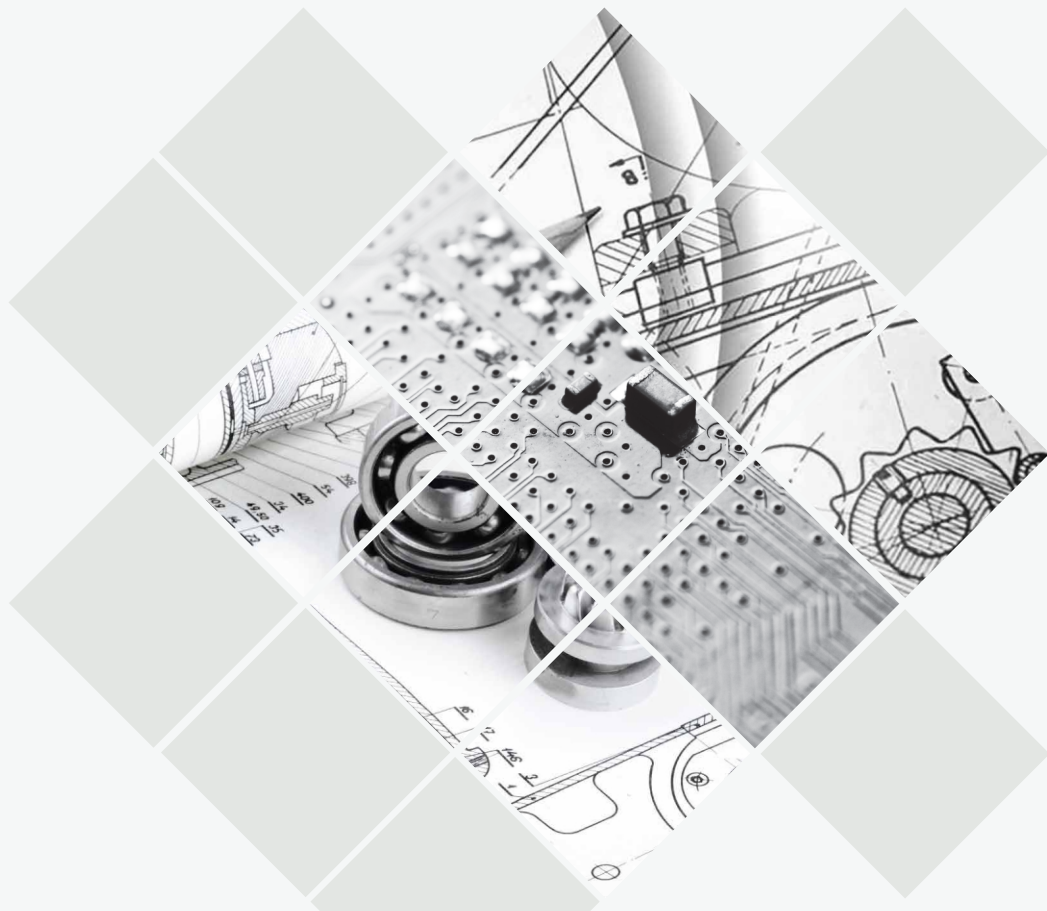


Capability Building in an ESO



Sudhakar D C
Deputy Manager,
Technology Excellence Group
QuEST Global

contents

Abstract	01
1. Introduction	02
2. Service offerings	03
3. Capability Building	03
3.1 Competency Development Framework	04
3.2 Trainings	06
3.3 Consultant's network to develop capability	07
3.4 Technical stream growth path	07
3.5 Technology Demonstrator (TED) projects	08
3.6 Association with professional bodies	08
3.7 Acquisitions	09
3.8 Capability building for innovation	09
3.9 Collaboration	11
4. Conclusions	11
5. References	11
About the Author	11
Declaration	12

LIST OF FIGURES

Figure 1 : Key drivers for ER&D offshoring, shifting from cost to capacity augmentation to innovation	02
Figure 2 : QuEST Global Portfolio	04
Figure 3 : Competency Framework Development	05
Figure 4 : Association with professional Bodies	08
Figure 5 : Workflow for facilitating innovation culture	10



Capability Building in an ESO

ABSTRACT

This white paper encompasses salient options of Capability building for Engineering Services Outsourcing (ESO) organizations. NASSCOM and Booz Global ER&D Report's block diagram depiction from the past to future trend of ESOs has been considered at a top level for maintaining the flow of this content.

This paper brings out how the engineering resources capability requirement has been transforming from just digitising engineering drawings and management of engineering change order to innovation and product development.

The “Service offerings” section indicates how QuEST has positioned itself in the market with its service portfolio offerings while taking care of immediate and short term requirements along with the sight of future long term needs. The objective was to set a direction for capability building for the future leadership in the market.

With the direction being set, different mechanisms for capability building have been discussed in detail. Details of how QuEST Global has leveraged these mechanisms have been explained below.

Finally, the future trends of engineering capability requirements towards innovation / product development and collaboration necessities have been discussed to create awareness of potential high performance that contributes value to business.



Capability Building in an ESO

1. INTRODUCTION

Building capability along with talent is important for business leaders from short-term as well as long term needs. Organizations are focused on building capability to achieve leadership in performance. To achieve this, organizations need to explore the potential of resources, facilitating them to be the best in what they do and develop their future skill-sets. In order to balance both short-term and long term oriented capabilities, both factors of external environment and organizational internal core priorities are to be kept in view. It requires a practical approach of looking outside the organization to note how the market is transforming and set a vision for the organization's future.

National Association of Software and Service Companies (NASSCOM) is an industry body that sets the norms and policies for IT and ESO service industries. Here we try to understand the directions set by this industry body as a guide to capability development.

The top level depiction of how ESO industries have been evolving is shown in Figure 1.

For about three decades, both Original Equipment Manufacturers (OEMs) as well as Independent Software Vendors (ISVs) sought

tactical engineering support by leveraging Engineering Service Providers (ESPs) through human resource strengthening models for cost arbitrage. Due to the enablement of extensive usage of software and hardware technologies to perform engineering activities along with required talented skill sets being available to execute tasks across geographies, the ESPs were able to provide easy global access to customers. This situation allowed the customer to scale indefinitely and at any desired location. The outsourced jobs were restricted to very basic tasks like scanning and digitizing engineering drawings and were scoped further up to the level of management of engineering change order. At this juncture, engineering a product was deliberated to be a core activity and was not outsourced considering it to be 'Intellectual Property' centric.

Post 2003, capacity augmentation became the prime focus for ESPs. However customers required ESPs to support them on cutting down the product development cycle, time to market and they also demanded a ramp-up only when they needed, which in-turn helped manage their operational expenditure.

Post 2010, the emerging markets became attractive to most OEMs.

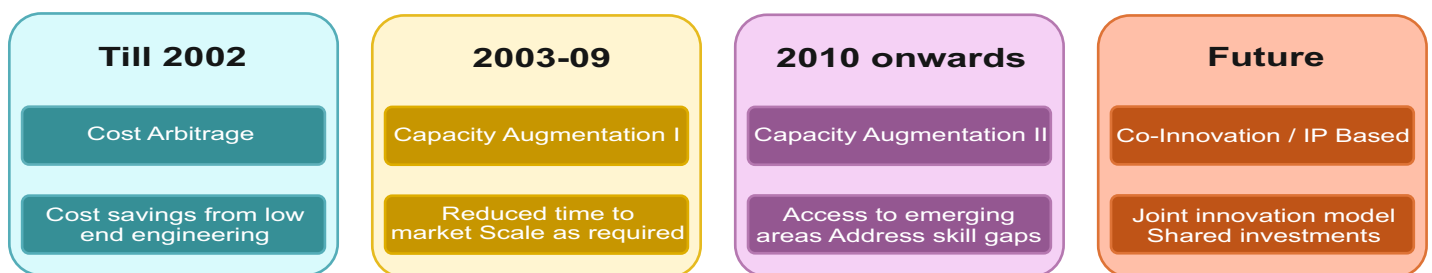


Figure 1 : Key drivers for ER&D offshoring, shifting from cost to capacity augmentation to innovation

Source: NASSCOM and Booz Global ER&D Report, Oct 2012



Capability Building in an ESO

Today's business, driven by cost concerns and product lifecycle rigidities, are more and more dedicated towards emerging and evolving effective outsourcing strategies that drive strikingly substantial improvement in global engineering and R&D operations. Recently, the engineering services outsourcing market has boomed to encompass a wide range and also extending towards new product development, product support functions like 'After-Market Services' and 'Value Engineering'. Eventually, the growth of future ESPs will rest on how well they are able to energize and run product innovation programs for customers in the 'risk and rewards' type of investment models.

Habitually and customarily, in a product oriented world, new product development has always been considered as intellectual property. Collaboration was not very prominent until recently.

In the past 5 years, there has been a major swing away from products alone, to a network of services around the product dedicated to end user experience. There is a necessity for development of the product, it's linked fields, it's vertical industries and it's geographic explicit variants for establishments to go to marketplace. The competition in the global market place and reduction in product lifecycles are compelling OEMs to manage their value chains to hold on to their market share.

In this changing scenario, QuEST Global has continuously kept pace in terms of capability development. The rest of this paper gives details of the steps taken by QuEST Global.

2. SERVICE OFFERINGS

As discussed above, to balance the short-term and long term capability management, QuEST needs to position itself in the market for current existing scenario of its services portfolio offerings while addressing, and at the same time not losing its present-day sight, on the future adverts. Starting from Engineering Analysis and Detail Engineering in the past, QuEST has evolved its services portfolio in order to position itself in the market in line with the product life cycle and its capability spread as part of its offerings. Figure 2 gives a snapshot of the capabilities offered by QuEST Global across the product life cycle.

Engineers generally have skills / capabilities to work in one of the above mentioned areas. They typically start specializing in a particular service and grow. QuEST Global recognizes the need to develop capability along these service lines and has built a system to support this need.

3. CAPABILITY BUILDING

With technology in a development stage, it has been an uphill thrust in the recent years to build capability. With the traditional engineering methodologies there aren't enough infrastructures to build and ramp-up quick capabilities. The ESOs possess work around solutions to make capabilities available, at its own discretion and disposal, for customer needs. After tracing the beaten track through cost arbitrage, cost saving from low end engineering, capacity augmentation-stage1 and reduced time to market scale as required, QuEST has evolved several strategies and

Capability Building in an ESO

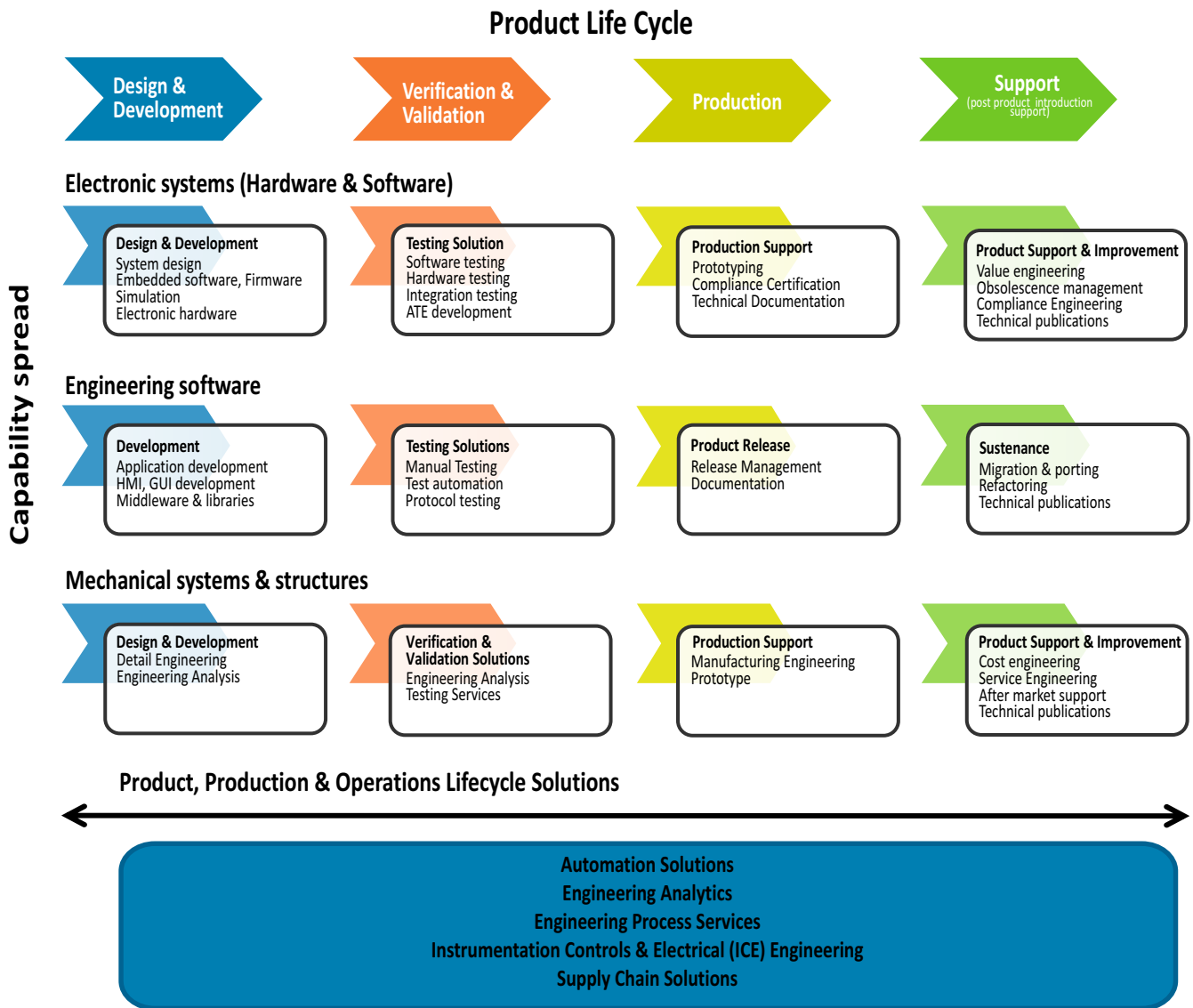


Figure 2 : QuEST Global Portfolio

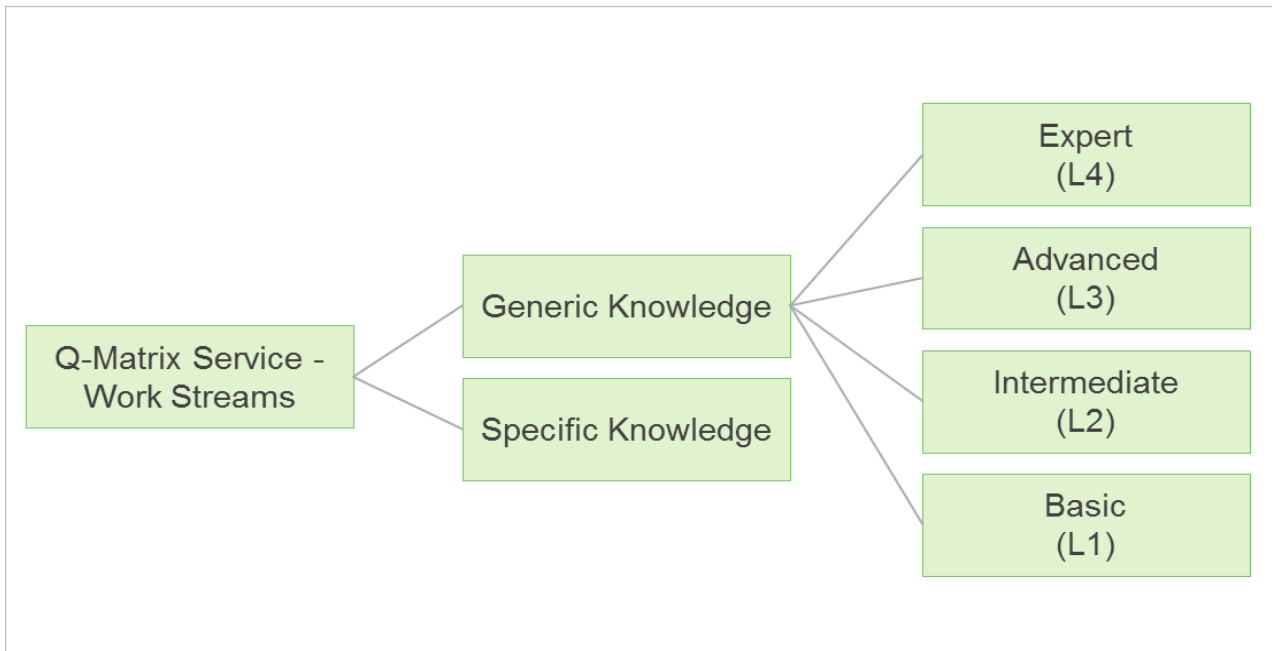
systems in place to develop/possess the required capabilities for futuristic engineering services.

- 1) Competency Development Framework
- 2) Training
- 3) Consultant's network to develop capability
- 4) Technical stream growth path
- 5) Technology Demonstrator (TED) projects
- 6) Association with professional bodies
- 7) Acquisitions
- 8) Capability building for innovation
- 9) Collaboration

3.1. Competency Development Framework

Competency Development Framework is the backbone of capability building. Figure 3 gives a snap shot of this framework. A competency framework matrix is generated for each of the service detail with the aid of a set of subject matter experts of the corresponding service detail. Lists of all the types of competencies which are functionally required to execute project deliverables are collated. Four levels of

Capability Building in an ESO



No	Competency	Description	Learning map -0-1	Competency Required-Level-1	Learning map -1-2	Competency Required-Level-2	Learning map -2-3	Competency Required-Level-3	Learning map -3-4	Competency Required-Level-4
1	Drawing Reading and Interpretation	Undergo training on Fundamental Engineering Drawing. Read 'Blue print reading' books. Test book. Undergo training on Drawing reading practice (JCM) (Dimension (Notes/Symbols) Practical exercises. Refer Model / Drawings from Delivered project. Plant with Refer Engineering Drawing Vs Manufacturing Process. Study Electronic model & drawing database.	Understand Scope from SOB / Input drawing/ Communication Sheet / Change Note (EQ, DM, CO, CD etc.) / Model / Checklist / Reference Drawing / Work Instructions / Best Practice / Lessons learnt etc. Understand Angle of Projection / View / Sheet Size / View and Section. Able to read the drawing and visualize Components / Assembly (No Primitive based components like Shafts, Flange, Brackets etc.). Able to identify the form of the component from drawing (Color, Tinting, Fabrication, Machining etc.). Can read all types of Dimensioning practice (Basic / Reference / Call outs / Notes etc.) Read and understand general tolerances and notes applicable to entire drawing. Read and understand GD&T / Welding / Machining.	Undergo basic training on drawing topic (Coloring/Erasing/Dimensioning/Assembly/Machining/Plating/Tracing/Decorative Drawing) Complete the Exercise on Spotting the difference in the drawing (Sketch) - Attention to detail. Undergo study on Electronic model & drawing database. Undergo Basic course on GD&T, Welding symbols. Practice sample model creation with form features (Incs. if each type). Undergo training on Manufacturing approach to start the modeling (Shop drawing, Operation, Process drawing). Study on 3D modeling methodology/techniques/applications.	Able to read the drawing and identify the Form / Product type & assembly. Able to detect missing information / Annotations from the drawings (Sketch) - Attention to detail. Understand the function of GD&T, welding symbols and fabrication notes with minimum guidance. Understand the manufacturing processes specified in the drawing (Dimension of machining operations / Specifications / Notes). Can read configuration drawing (part family tables). Able to judge feasibility of Modeling / Detailing a part in a given tool environment.	Interaction within the modeling expert study best practice & lesson learnt. Undergo training on the drawing standards (Inspection & testing methods) on the shop / Allowance (Machining process). Can visualize and model parts from development drawings using hand-drawn details etc. Able to visualize the inspection and testing methods from drawings.	Can identify functionality of the part Design intent for modeling. Able to identify the applicable drawing standard (IS, ASME, DIN). Understand basic / general arrangement drawings (Details drawings, full-size layouts etc.). Can read installation, commissioning, sequence of installation / assembly etc. Able to read highly contoured surface type drawing (artwork, 8 figures, models, blades). Can visualize and model parts from development drawings using hand-drawn details etc. Able to visualize the inspection and testing methods from drawings.	Study on previous projects (Drawings sample models / Design Data book) Participate in TQM / Technical Discussions with concerns on various projects initial stage. Show ability to create the notes, specifications, tables etc. to functional requirements. Able to guide other when there is ambiguity / error in the drawing.	Able to identify / visualize parts or features even with damaged drawing, missing views, form-hand sketches, checklist standards and poor quality drawings. Can validate the completeness of the drawing. Can identify the critical parameters, CTDs from the drawing. Show ability to create the notes, specifications, tables etc. to functional requirements. Able to guide other when there is ambiguity / error in the drawing.	
2	Drafting	Undergo on job training / Secure drafting projects. Refer Drafting Manuals / Best Practice / Procedures / Work Instructions / Lessons learnt documents.	Can use templates / tool / Start part / Templates, Drafting standards, Units, Scales, Sheet Size, Dimensions, Annotations etc. Understand and follow the prescribed method or approach for Drafting. Able to place views in line with angle of projection, Association Dimensions / GD&T / Welding / Machining Symbols and BOM, Parts list, Notes, Tables, Title block, Bill of Material, Revision block etc. Able to create drawings for the machined parts with reference drawings or reports. Able to validate the drawing based on the Reference Drawing / Associates to Models / Drafting Standards.	Undergo GD&T Basic Training & Exercise book (Lab Training for inspection awareness) Practice on cad tool to place GD&T symbols. Undergo Welding Symbols (Machining symbols Basic training & Exercise book) Practice on cad tool to place symbols. Undergo exercise on placing assembly views & break out sections (if wanted). Undergo exercise on part family configuration drawing (if exercise). Undergo exercise on model parameter linkage to drafting (if exercise).	Understand and place Geometric Dimensioning and Tolerancing symbols, machining and welding symbols, sheet metal and fabrication notes. Can create assembly drawings, exploded view and Break out section. Able to create configuration drawing (part family tables). Can link the model parameters (Expressions, custom properties, relations) into the drawing. Understand and applies the format requirements for the completeness of the drawing (sequencing, designation, labeling, revision letters and zone reference etc.).	Basic startup analysis training. Exercise on tolerances & assembly drawing / Required drawing standards. Refer Part practices, Lesson learnt/ Perform Technical Review / Study various tools setting, preferences, options on the existing practices / exercise on customization. Able to transfer drawings from one drawing standard to another. Able to provide various solutions to support Designer / Designer. Demonstrates ability to create drawings with or without reference drawing.	Study similar projects & Background design details / Latest Standards (development in Review) Interaction with other teams. Study on design data book (Global ASME, ANSI, BS, DIN, IS etc.) Drafting Standards practice / Exercise book. Perform Technical Reviews (Prepare work instruction / Drafting methods / Detailed Drafting methodology/ Best practice / Lesson learnt). Undergo Advanced GD&T training / Think on manufacturing process to apply GD&T symbols and tolerances. Interact with Designers / Manufacturing.	Study similar projects & Background design details / Latest Standards (development in Review) Interaction with other teams. Can train and mentor in the various Drafting Methodologies / Standards / Best Practices. Able to provide the details / Validate the GD&T, Manufacturing, Inspection, Process requirements in the drawing. Can make build to print drawings in discussion with design/manufacturers. Able to make drawings considering their tolerance and interference checks (Example Bolt length calculation).		

Competencies and Learning maps

Band	GENERAL										
	1E	1D	1C	1B	1A	2B	2A-M	2A-T	2B-M	2A-T	
Drawing reading	1	1	2	2	3	2	2	3	2	4	4
Drafting	1	1	1	1	1	1	1	1	1	1	1
Knowledge of Working Practices / Methods / S	1	1	1	1	1	1	1	1	1	1	1
Tool Knowledge	1	1	1	1	1	1	1	1	1	1	1
Manufacturing Knowledge	1	1	1	1	1	1	1	1	1	1	1
Knowledge of Preferred / Recommended Materials	1	1	1	1	1	1	1	1	1	1	1
Process Planning	1	1	1	1	1	1	1	1	1	1	1
Inspection Planning	1	1	1	1	1	1	1	1	1	1	1
Fixture Engineering	1	1	1	1	1	1	1	1	1	1	1
CIAM Support	1	1	1	1	1	1	1	1	1	1	1
CIAM Support	1	1	1	1	1	1	1	1	1	1	1

Competencies Vs Roles Mapping

Band	1E	1D	1C	1B	1A	2B	2A-M	2A-T	2B-M	2A-T
Trainer										
Engineer										
Senior Engineer										
Lead Engineer										
Project Leader										
Project Manager										
Technical Manager										
Program Manager										
Principal Engineer										
Chief Engineer										

Assessment

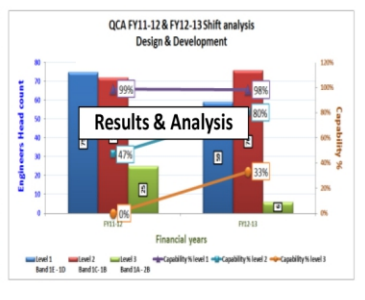


Figure 3 : Competency Framework Development



Capability Building in an ESO

proficiencies are described for each competency. It also includes the learning map to progress from lower to higher level of proficiency. The proficiency descriptors are defined from Level 1 to Level 4 in the resource capability form of awareness (Base level), comprehension (Intermediate level), synthesis (Advanced level) and mastery (Expert) respectively. Subsequently the resources' hierarchical roles are mapped against each of the competencies indicating the proficiency level that needs to be demonstrated through an annual assessment cycle.

This competency framework matrix forms the basis for developing training plans and its contents, which the resources would eventually undergo. Following which, resources undergo an online annual assessment, applicable to their role. The assessment helps to identify the gaps in an individual's competency. This gap analysis is used for assigning relevant trainings to close the capability gaps in resources.

3.2. Trainings

At QuEST, Competency Development Council (CDC) governs all competency development initiatives and activities across the organization and Competency Development Head (CDH) is responsible for competency related activities. CDC will review progress in competency development at individual, CoE (Centre of Excellence), and organization level to help resolve issues or address improvement opportunities.

Training requirements are classified based on organizational needs, competency

requirements, manager inputs, or others as applicable.

In continuation with the discussion above in “Competency Development Framework” section (3.1), capability gap analysis data is used to assign relevant training programs. Learning and Development in the organization is managed at an individual level through a program called Individual Development Plan (IDP) administered centrally with the help of a software tool generated in-house for this purpose and also with the help of customised best in the world 'Learning Management System (LMS) tool. The lists of all trainings that can be provided are mentioned in the catalogue of IDP tool. 'Managers' and 'Engineering Leaders' along with 'Engineers' come-up with a plan for individual developments based on the competency gaps and the up-skilling needs. The manager then populates this plan into the IDP tool. The type of learnings could be in various forms and modes such as:

- 1) Self-reading
- 2) Library references
- 3) Instructor led training – internal and external
- 4) E-learning
- 5) On-the-job training
- 6) Workshops
- 7) Seminars and conferences
- 8) Certification courses
- 9) Centre specific training
- 10) Knowledge sharing sessions
- 11) Case studies

Trainings are imparted post which short assessments are conducted to measure its absorption. If the trainee's scores are not satisfactory then the training cycle will have to be repeated. For all trainings delivered, feedback



Capability Building in an ESO

will be collected from the participants through a training feedback template. Trainings would be considered effective as per the criteria set in the training process document. Further the effectiveness of the training, into its function, is also measured after a couple of months to check how effectively the learnings from the training are being used in day-to-day functions through an L3 type of feedback survey system. Feedbacks are received from the participants' managers to make the necessary alterations in the training course.

Depending on the sales growth projection for a 5 year plan, organization leadership provides the focus plan to ramp-up for various functions and different services. This data is used by CDC to determine entire training programs for such requirements.

3.3. Consultants' network to develop capability

Generally in an ESO like QuEST Global with a diversified portfolio, work demands different levels of capability engagements on various varieties of topics and domains. QuEST Global engages the services of high capability resources on a need basis. These high capability resources are freelance specialist consultants who bring in their exceedingly pertinent rich experiences along with them, typically retired personnel from reputed Original Equipment Manufacturer (OEM) organizations who were previously holding key role positions. QuEST Global is well connected with the network of these consultants through an internal management system. Once engaged with QuEST Global, these consultants train existing

resources in various ways to bring them up to speed while providing consultation to execute highly technical projects. Thus, going forward, this capability is percolated and spread across appropriate teams in a cascading manner.

Consultant type of engagements has helped QuEST Global build strategic relations with customers. Their contributions are typically on technical solutions, engineering process, technical capability, knowledge management, delivering technical training and project consultations.

3.4. Technical stream growth path

The need for developing technical capability resulted in re-architecting the growth path for engineers in QuEST Global. We implemented a dual growth path from the manager level – M stream for those desiring to get into people/project management and T-stream for those desiring to continue on the technical side. This dual path allows the capability development of those who like technical management in a focused manner. At QuEST Global, we have separate assessment and development programs for staff in the T-stream. Their aspirations are in line with the company goal of developing technical capability to meet the needs of customers. In this stream, the staffs not only add capability to their teams and projects, but evolve new practices, roadmaps for technology, interface with customer technical groups and develop technology strategies to help grow the business.

Capability Building in an ESO

3.5. Technology Demonstrator (TED) projects

Technology Demonstrator projects are an aid to business growth through new and fast growing opportunities. It helps to improve readiness for e.g., new service as well as / or new vertical. It can also help in addressing customers' emerging needs. These are projects that help to develop capability in new domains / technologies. A new capability is built after successful completion of such projects, which can be show cased.

QuEST Global has executed several TED projects. These have helped to build the capability required to address the changing requirements of customers as explained in the NASSCOM report.

3.6. Association with professional bodies

QuEST Global encourages and provides sponsorships for various software tool

certification programs and other certification programs like Society of American Value Engineers (SAVE), International Council on Systems Engineering (INCOSE), Production Part Approval Process/Advanced Part Quality Planning (PPAP/APQP), Geometric Dimensioning & Tolerance (GD&T) etc. It encourages its resources in presenting technical papers at various forums. It also sponsors memberships and associations with professional bodies such as American Society of Mechanical Engineers (ASME), Royal Aeronautical Society (RAS), Society of Petroleum Engineers (SPE), Institution of Mechanical Engineers (IMechE), National Agency for Finite Element Methods and Standards (NAFEMS) etc. These professional bodies provide a platform for our engineers to interact with other engineers across the globe enabling a good cross pollination of engineering capability amongst different verticals.



Figure 4 : Association with professional Bodies



Capability Building in an ESO

Simultaneously internal branding of technical experts is supported through hosting the expert list in the organization's intranet with their profiles and their list of expertise. In case if any of the resources is in requirement of unique technical expertise and do not know whom to look for, they can use the experts list page in QuEST Global intranet to seek guidance from and in the event would aid in cross skilling of capabilities.

3.7. Acquisitions

Business acquisitions are made to enhance the growth of an organization in-organically. At QuEST Global, acquisitions are done globally amongst different geographies. The capability benefits out of acquisitions are multi-fold:

- 1) Diversifications of services and verticals, thereby acquiring new capability
- 2) Obtaining extra skills, knowledge and competency capabilities
- 3) Transfer of skills, knowledge and competencies between QuEST Global and acquired company helps in cross pollination of capabilities
- 4) Different capability distribution across different geographies with Local-Global business models
- 5) In the process of acquisition, buying of new intellectual property is a big gain in terms of capability

With new capabilities being acquired, QuEST Global can leverage them in expansion of its service offerings portfolio with integrated

solutions to attract more businesses.

3.8. Capability building for innovation

The abilities of organization to develop new ideas/innovations currently stand out as top priority as it goes forward. It is only through innovations that organizations produce new products, process and systems necessary to get accustomed to mutable markets, technological know-hows and a means of staying ahead in the business race.

QuEST Global is committed to nurture innovation by providing the right infrastructure and environment that enables employees to push the envelope and think out-of-the-box. It understands that innovation is not a one-time temporary strategy but a continuous endeavour that empowers its resources in finding newer, better, improved ways of managing, conducting and executing all facets of its business. It provides requisite mechanisms to capture ideas that could prove to be tomorrow's game changer. QuEST Global's 'Ideas' portal promotes a culture of innovative thinking.

QuEST Global participates in customer open innovation initiatives as well. It receives the list of challenges from its customers along with the background and context. As part of the innovation process QuEST Global floats the challenges across the organization to collect unbiased ideas. The ideas are internally evaluated and challenged by technical experts before passing them back on to customers. A cross functional team is formed to further investigate and gain more inputs and develop the ideas further. An R&D project is undertaken to take the



Capability Building in an ESO

A workflow for innovation portal is created at QuEST Global to facilitate and fund it's activities.

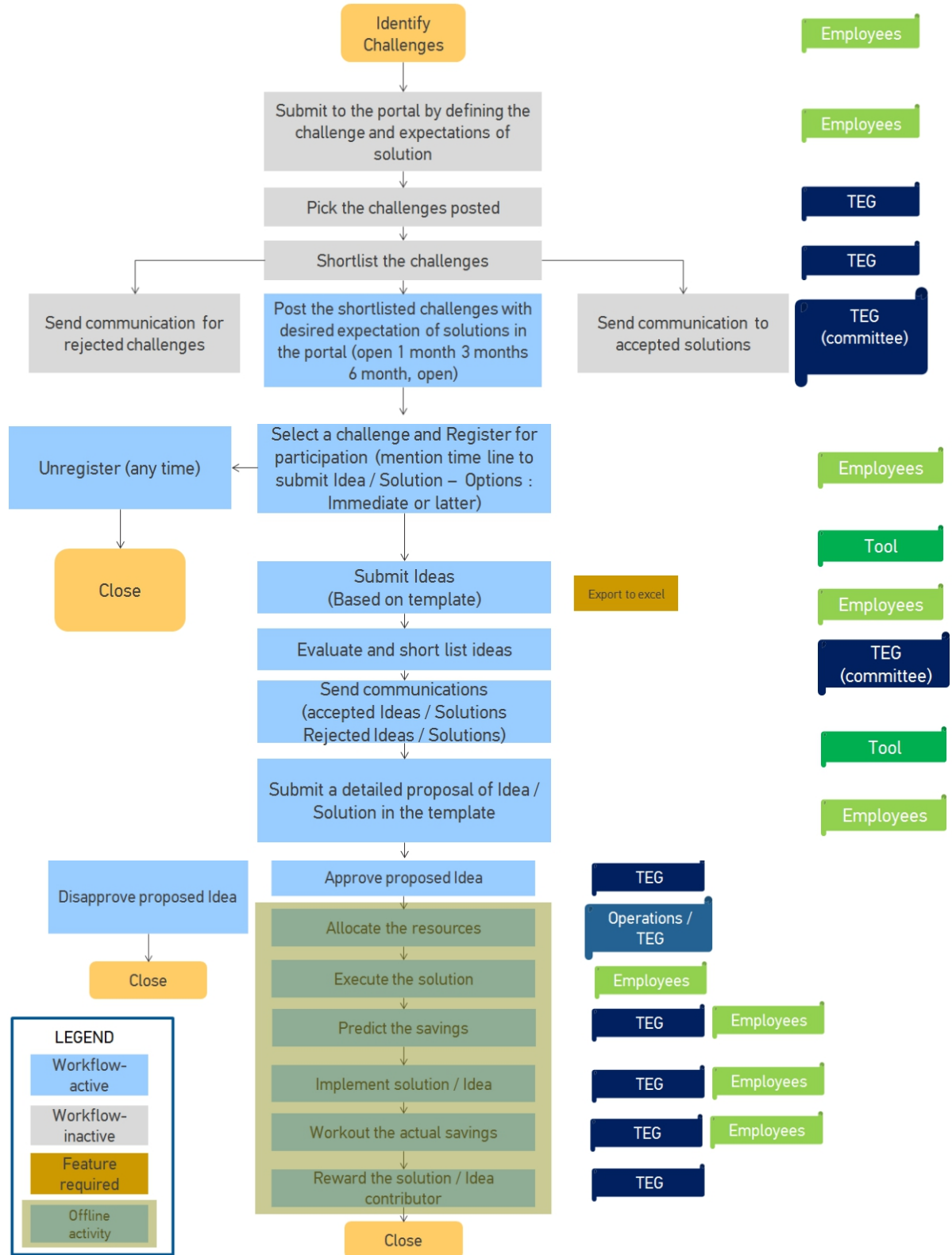


Figure 5 : Workflow for facilitating innovation culture

Capability Building in an ESO

idea forward. This whole engagement provides an opportunity to play a vital part in nurturing the innovation culture enhancing QuEST Global's capability while partnering with customers.

3.9. Collaboration

As the needs of customers enlarge in scope and technologies become more specialized, it is sometimes very difficult to build capability from within an organization. It may also not be financially viable to maintain such a capability. Therefore, QuEST Global has tied up with some niche vendors (like Siemens, Julia etc.) to develop capability in the areas of manufacturing engineering and software.

All through such cases QuEST Global does collaborate and work together with partners which would provide insights of the entire delivery enhancing capability.

4. CONCLUSION

A comprehensive approach for capability building is crucial to align with the business needs and goals of the organization. As discussed earlier, it is evident from NASSCOM's report about how the ESOs have been evolving and heading towards innovation and collaboration as a future trend. In an attempt to protect both short-term and long-term goals, an organization should come-up with the right predictions of its market sales as it sustains along the journey towards future leadership achievement. Based on the journey of growth, resources' capacity vs capability requirement pyramid structures have to be determined.

With the current diversified portfolio of services

offerings at QuEST Global an ever expanding in-organic portfolio of services aid in providing integrated solutions offerings. Additionally, new capabilities through innovations, Technology Demonstrators, consultants' network and collaborations have enabled QuEST Global to position itself well enough to provide holistic integrated solutions for entire range of engineering products and development of its systems with high performance for any new technological challenges that exist or may arise which contributes value to business.

5. REFERENCES

- 1) NASSCOM and Booz Global ER&D Report, Oct 2012
- 2) http://www.nasscom.in/sites/default/files/Article_News/HCL-ESO-Unraveling-Myths.pdf

ABOUT THE AUTHOR



Sudhakar D C is a Mechanical Engineer possessing an overall experience of 23 years in mechanical engineering sector with systems design and new product development expertise. He has a wide experience of heading turnkey engineering projects for developing a range of turbomachinery products like gas turbines, micro gas turbines, steam turbines, air turbines, turbo power pack propulsion systems for military



Capability Building in an ESO

applications and aircraft undercarriage sub-systems for landing gear applications. He has also undertaken many defence R&D initiatives as well.

He is associated with QuEST Global from past 10 years with different roles of core engine design for aero-engines, new product developments and support services for manufacturing engineering. He is currently on the corporate role with “Technology Excellence Group” (TEG), engaged in activities like capability and technical solutions.

DECLARATION

No customer propriety material is included in the whitepaper. This whitepaper can be published in QuEST Global website for attaining a market position.



BORN TO ENGINEER

www.quest-global.com