Project Dissertation Report on

"MARKETING OF OUTSOURCED ENGINEERING SERVICES"

Submitted by:

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2k19/EMBA/508

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Under the Guidance of:

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DECLARATION BY THE CANDIDATE

I the undersigned solemnly declare that the project report **"Marketing of outsourced engineering services"** is based on my own work carried out during the course of our study under the supervision of Prof. Rajan Yadav.

I assert the statements made and conclusions drawn are an outcome of my research work.

I further certify that

I. The work contained in the Project report is original and has been done by me under the general supervision of my mentor.

II. The work has not been submitted to any other Institution for any other degree/diploma/certificate in this university or any other University of India or abroad.

III. We have followed the guidelines provided by the university in writing the report.

Signature _____

Name _____

Enrolment no./ Roll No. _____

CERTIFICATE

This is to certify that Ashish Rai, Roll no. 2K19/EMBA/508 student of Master of Business Administration (Executive 2019-2021) at Delhi Technological University, Delhi has accomplished the project titled **"Marketing of Outsourced Engineering services"** under my guidance and to the best of my knowledge completed the project successfully, for the fulfillment of the course in IVth semester of the course Executive MBA.

Prof. Rajan Yadav

Delhi School of Management (DSM)
Delhi Technological University (DTU)

ACKNOWLEDGEMENT

In the pursuit of management excellence, every student owes a great deal to the insights and suggestions of others and we are no exception. We believe learning is a process that entails give and take, exchange of ideas and value addition through discussion.

I begin by acknowledging our humble thanks to Prof. Rajan Yadav for giving us this opportunity to undertake this important assignment in our academic career and for her constant guidance, constructive criticism as a project guide, which brought this challenging task to success. I would also like to express our gratitude to the project managers of the different companies who responded to our survey.

Our unfathomable respect to our parents and other family members whose everlasting love, keen interest and constructive suggestions made us confident.

Last, but certainly not the least, we would like to thank our friends and all who directly or indirectly contributed in the successful completion of our project work.

Ashish Rai
Executive MBA
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EXECUTIVE SUMMARY

Purpose

The purpose of the project is to understand the business model of Engineering Services Outsourcing and understanding the critical success factors for India as an outsourcing hub and significant factors which affect the success of ESO vendors.

Design/methodology/approach

In order to do this study there are certain pre-requisites which need to be fulfilled and hence are discussed in the report.

- The concept of Engineering Services Outsourcing, market demand of various services, engineering services outsourced in various field, risks involve in outsourcing engineering services and scope of Indian ESO vendors is discussed in the report.
- Also the dynamics of selection of services to outsource and the pointers for selection of ESO vendors are detailed.
- Various contractual issues involved in outsourcing and their impact are highlighted.
- For the primary research firstly exploratory research was done to understand the business model of Engineering Services Outsourcing with a focus on issues such as the countries which contribute maximum clientele to the Indian ESO vendors, service outsourced, pricing mechanism of the services, legal aspects of outsourcing, various channels of getting orders and tools used for promotion etc. This was done by conducting a depth interview of an experience project manager of one of the well established IT & Electronics Engineering services outsourcing companies.
- This is followed by doing a descriptive research through a survey of IT companies to understand the importance of various factors in selection of ESO vendors, importance of various factors considered in the selection of the services to be outsourced, effectiveness of various tools of promotion etc.
- The **findings** of the research are concluded in the final chapter.

PART 1: INTRODUCTION OF THE PROJECT STUDY

1.1 What are Engineering Services?

Engineering services(ESs) are those services that work with key engineering processes or are associated with them.

Examples are:

- CAD / CAM (computer aided manufacturing / design)
- Auto design
- Failure analysis of structural steel

A difference must be made between engineering functions and ES functions in this case. An engineering function may be the manufacture of automobile engines. Designing the engine is a related engineering service function. It is analogous to the difference between production and manufacturing support services in the manufacturing industry.

Organizations, especially engineering and construction builders, have historically used by engineering and design firms and individuals to provide expert services, mainly where specific knowledge was needed that the company lacked or did not want to acquire "in house." Regular functions were handled using internal resources. The transaction costs associated with contracting engineering or design companies to execute such regular tasks exceeded the advantages of doing so. Additionally, the domestic skill pool available to undertake regular engineering and design work was inexpensive enough to support employing and retaining that expertise.

Things are changing as a result of advancements in communication technology and a flattening globe. Today, organizations conducting internal operations reviews evaluate engineering and design services(EDS) on an equal footing with other internal business support tasks that have been outsourced or are in the course of being outsourced. This research looks beyond standard contractual arrangements for professional EDS and toward a more closely integrated and highly leveraged use of strategic partnerships to routinely do a greater amount of such work. EDS are ideal for outsourcing – delegating responsibility for the execution of a normal in-house activity or function to a third party for a certain length of time. What are the commercial and legal considerations that must be made when outsourcing such functions?

Outsourcing started with data centers and has since expanded to include a wide range of commercial services. Whatever the task, fundamental challenges such as service scope, performance requirements, price, transfer, intellectual property, and remedies all remain the same. Numerous concerns, such as poor (or even average) performance, high expenses, security, late delivery, and regulatory compliance, remain consistent with previous forms of outsourcing.

1.2 Background

Today, over 150 MNCs are using the engineering expertise of Indian companies. A good number of them are in the telecom and technology space. The other major business areas are automotive, heavy machinery and construction. Some other areas where these services are used are electric utilities and aerospace.

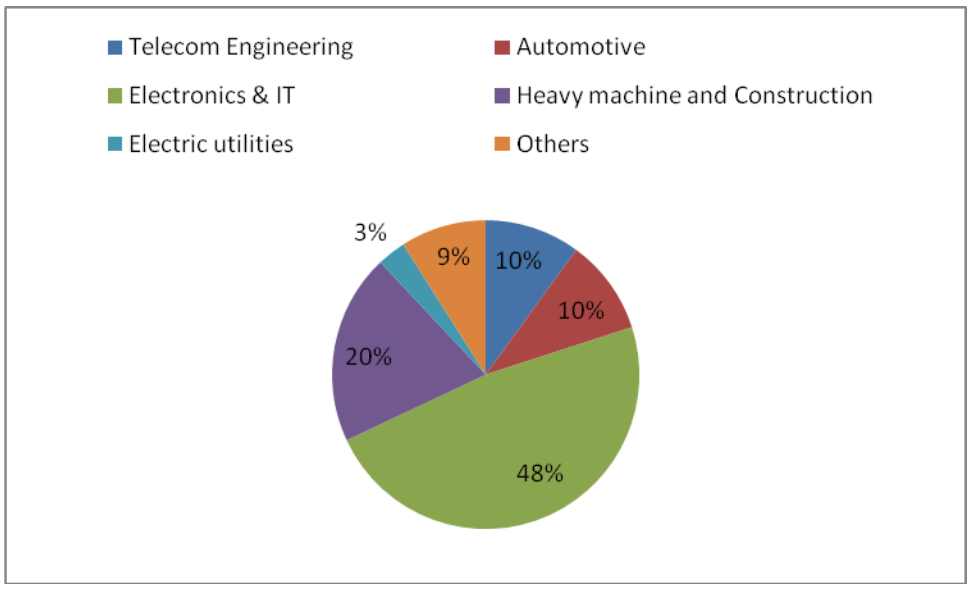


Fig1: Break up of Engineering Services Out sourcing (ESO)

Presently, ESO forms only 3-4% of the world wide spends on Engineering R&D. If design peripherals are taken at 20% of the total product, a potential growth of six times the current growth can be envisaged.

The total expenditure of ESO is currently estimated at USD750bn per year. This is growing at a steady pace and is expected to reach USD1tn by 2020. India is expected to get 10% share of this which estimates the revenue to be around Rs 100,000 Cr. The major competitors for India are China and former Soviet Bloc countries.

1.3 Problem Statement

- Continuous pressure from Wall Street to cut costs and improve efficiency
- Drive growth by tapping into emerging markets (especially BRIC countries);
- Less stringent labor laws (than Europe);
- Increasing confidence in supply base; and
- Positive reputation of low cost engineers in the U.S.

Organizations that outsource are seeking to realize benefits or address the following issues:

- **Cost savings**

  The lowering of the overall cost of the service to the business. This will involve reducing the scope, defining quality levels, re-pricing, re-negotiation, and cost re-structuring. Access to lower cost economies through offshoring called "labor arbitrage" generated by the wage gap between industrialized and developing nations.

- **Cost restructuring** — Operating leverage is a ratio of fixed to variable expenses. Outsourcing alters this ratio's balance by allowing for the transition from fixed to variable expenses and by keeping variable expenses more manageable.
- **Improve quality** — Obtain a significant improvement in quality by contracting out the service and implementing a new terms and conditions.
- **Knowledge** — Accessible to intellectual property, as well as to a broader range of expertise and understanding.
- **Operational expertise** — Accessible to operational best practices that would be too time-consuming or impossible to build internally.
- **Access to talent** — Accessible to a bigger pool of talent and a stable supply of talents, particularly in engineering and technology.
- **Capacity management** — A more effective technique of managing capacity for technologies and services in which the provider bears the risk of delivering excess capacity.
- **Enhance capacity for innovation** — outsource knowledge service providers are increasingly being used to complement limited in-house capabilities for product development.

- **Reduce time to market** — Accelerating the development or manufacture of a product by using the supplier's increased capabilities.
- **Commodification** —The trend toward standardization of business processes, IT services, and application services enables SMBs to access services formerly reserved for bigger organizations.
- **Risk management** — For some kinds of hazards, risk management may include partnering with a service provider who is better prepared to offer mitigation.

While this picture is projected to alter in the next years, businesses in the United States are now under constant pressure to reduce costs and increase efficiency as a result of global competitiveness.

India is the country of preference for engineering outsourcing and offshoring at the moment. The presence of a sizeable independent provider base, the availability to one of the largest groups of researchers and technicians in the world, English language skills, high-level arbitration of labor, limited macroeconomic risk and close relationships with 2 of the fastest growing nations in the world (China and India) all constitute crucial elements. However, several of these Indian providers have successfully delivered business processes and IT outsourcing services, which have enabled companies in Western markets to start giving engineering services to Indian providers too. It is thus true that many vendors are highly recognized in Western markets for their business operations and IT outsourcing capabilities with a few remarkable exceptions, but have lately increased their engineering abilities and provided efficient off-shore EDS.

1.4 Objective of the study:

The primary objective of the study is to understand the current scenario of IT Engineering Services Outsourcing industry in India, to analyze the strategic capabilities required for successfully marketing IT engineering services and finding out the major international markets for Indian IT engineering Services Companies.

Following are the research questions that the study addresses:

- What is the basis for selection for the engineering services to be outsourced?
- Which are the international markets which offer maximum growth potential to the IT engineering services companies in India? What are the strategic strengths of India as an outsourcing destination?
- Which are the major IT engineering services outsourced in India?
- What is the pricing mechanism of the outsourced projects?
- Understanding the optimum promotional mix for engineering services?
- What are the contractual issues involved in engineering services outsourcing project?
- How are the process standards for performing a particular project decided?

1.5 Scope of the research

This study would help one to understand the factors which are to be taken while considering a particular service to be outsourced. One would be able to understand what capabilities are required to qualify for being a vendor of IT engineering services. Report would help in understanding the scope available in various markets.

Apart from this, one would be able to understand the crucial factors that affect the marketing of these services.

1.6 Research Design:

1.6.1 Exploratory research

- Firstly **secondary research** was carried out to find out the scope of ESO sector in India, major players of the sector, and services outsourced in different branches of engineering.

- This was followed by **primary research**, which was carried out by carrying out a depth interview of a **project leader** in one of the reputed IT & Electronic services outsourcing company based in Ahmedabad. The interview helped in understanding the business model of IT Engineering Services Outsourcing.

1.6.2 Descriptive research

This was followed by descriptive research which was carried out by interviewing **senior engineers** in **IT services outsourcing** companies based in Ahmedabad.

1.6.3 Research tool

- A semi-structured open ended questionnaire was used for the exploratory research.
- A structured closed ended questionnaire was used for the descriptive research

1.6.4 Sample characteristic

For these project senior engineers handling outsourcing project in the companies of Ahmedabad will be surveyed.

1.6.5 Data Sources:

- Magazines
- Websites
- Primary research survey of the companies

PART 2: LITERATURE REVIEW REGARDING THE CONCEPT OF ENGINEERING SERVICES OUTSOURCING (ESO)

2.1. Introduction to Engineering Services Outsourcing (ESO)

Firms, especially engineering and construction contractors, have historically used EDS to provide expert services, especially where specific knowledge was needed that the company lacked or did not want to acquire "in house." Routine functions were handled using internal resources. The transaction costs associated with contracting engineering or design companies to execute such regular tasks exceeded the advantages of doing so. Additionally, the domestic skill pool available to undertake regular EDS was inexpensive enough to warrant employing and retaining that expertise.

Things are changing as a result of advancements in communication technology and a flattening globe. Today, organizations conducting in house operational reviews to evaluate EDS on an equal footing with other domestic business support tasks that have been outsourced. What are the commercial and legal considerations that must be made when outsourcing such functions?

Outsourcing started with data centers and has since expanded to include a wide range of commercial services. Whatever the job, fundamental challenges such as service scope, performance requirements, price, transfer, intellectual property, and remedies all remain the same. Numerous hazards remain comparable to those associated with other forms of outsourcing, including substandard (or even average) performance, high pricing, security, late delivery, and regulatory compliance.

2.2. Scope of Engineering Services Outsourcing in India

Indian firms have effectively used the skill sets, tools, and expertise gained through outsourcing information technology software and services to establish a strong presence in outsourced product engineering and development. ES is a rapidly expanding market. Investment on ES is now estimated to be $750 billion, but is expected to reach $1.1 trillion by 2020.Out of this engineering services outsourced would come to 20% of this which comes to around USD40bn.

Taking India’s share to be 10-20% of this would be around Rs100,000 crore. Offshoring engineering services might result in the creation of an extra 150,000-200,000 jobs – or up to

1,000,000 with a multiplier effect. India must invest now in order to produce the requisite number of engineering graduates by 2020.

The Indian engineering outsourcing industry's primary assets are a large pool of available engineering personnel, strategic experience, and the comparative benefit of outsourcing versus constructing captive centers. India has the greatest reservoir of engineering expertise necessary to take on outsourced employment among emerging nations. The Indian labor is bilingual, adaptable to shift work, devoted, and capable of working under pressure to achieve project deadlines. However, there is a projected need to establish enough infrastructure and provide domain-specific specialized training to this pool of talent in order for them to satisfy the outsourcing needs of global OEMs and component manufacturers.

Indian firms excel in establishing long-term relationships with multinational organizations; they adapt fast to shifting global trends and business models in order to enhance their customers' value propositions. To emphasize the 'quality' of Indian services, Indian businesses are pursuing quality certifications such as SEI CMM Level 5, COPC, PCMM, and ISO 9001:2000. These advantages put India ahead of many other emerging countries such as China when it comes to outsourcing.

2.2.1. Strategies for success of India in the ESO market

India must establish a multi-pronged plan for success in order to capitalize on this potential. Several of the proposed initiatives are more wide in nature and are necessary to maintain our leadership in IT-BPO exports – and are now in different stages of preparation and implementation. Others are more focused, targeting the market for engineering services.

i. Build the “Engineered in India” brand
ii. Build domain expertise through symbiotic relationships with experts
iii. Focus on infrastructure creation
iv. Undertake initiatives to improve workforce
v. Leverage local industry ‘offsets’
vi. Align government policy and incentives

Build the "Engineered in India" brand

- Marketing India as a preferred destination by establishing a division dedicated to this sector.
- Developing industry-specific international trade organizations, organizing frequent trade events, and using Indian consulates to educate local and foreign governments on the advantages of offshoring. By forming symbiotic connections with domain experts, you may develop domain knowledge.
- Acquiring design firms in the United States, Europe, and Japan to acquire the necessary skills, as well as employing specialists from other nations

Focus on infrastructure creation

- With a physical infrastructure strategy based on islands of infrastructure and an engineering infrastructure approach based on consortiums
- Invest in projects that can help you enhance your workforce
- Address supply difficulties by investing in academic institutions and specific national-level technical diploma programs, as well as via allowing for private spending to expand supply. Address quality concerns by standardizing curriculum, training, and certification programs, investing in long-term internships, and enlisting the assistance of the government for recruitment.

Leverage local industry 'offsets'

- The government should adopt an organized approach to industrial leveraging - for example, major imports in Aviation, Military, and Energy must be offset via offset programs.
- Coordinate public policies and rewards
- Policies facilitating enough visas are accessible for business services, favorable international ties, investments in infrastructure, and strengthening laws to safeguard intellectual property.
- Rewards for innovation and R&D

2.3. Major ESO vendors in India

ESO vendors can be divided into following categories:

- Majors (those who are firmly in the field)
- Middlers(those who have forayed into the field and are growing rapidly)
- Aspirers(those who have entered the field and can be expected to grow in the future)

2.3.1. The majors:

- TCS (Automotive, aerospace, industrial machinery and construction. Current revenue around Rs 1000Cr)
- Tata Technologies (Automotive. Current revenue around Rs 900 Cr)
- HCL (Aerospace, Current revenue around Rs 500 Cr)
- Infosys (Manufacturing, Current revenue around Rs 300 Cr)

2.3.2. The middlers:

- Patni (General Engineering Services, Revenue around Rs 250 Cr)
- Infotech Enterprises Aerospace, Revenue around Rs 250 Cr)
- Rolta (Ship Design, Revenue around Rs 225 Cr)

2.3.3. The Aspirers:

- Quest (Aerospace, around Rs 150 Cr)
- Wipro (Telecom & Semi-conductor design, Revenue around Rs 150 Cr)
- L&T Infotech (Construction and Manufacturing. Revenue around Rs 140 Cr)

- Neilsoft (Construction & Automation, Revenue around Rs 70 Cr)
- Geometric Software (Automotive and Consumer Products, Revenue around Rs 50 Cr)

2.4. Difference between engineering and other outsourced functions

Generally, firms outsource in order to maximize profits. Labor arbitrage is a key possibility in the offshore providing of engineering services. Indian and Chinese engineers are less expensive than comparably educated and certified engineers in the United States or Europe. Additionally, ES providers may specialize in the supply of ES and use that expertise across a broader client base than just one. This stress may also result in cost reductions. While accuracy, expertise, and compliance are critical, outsourcing may also act as a catalyst for transformation, whether via

consolidation or process modifications; nonetheless, generating profits with proper money saving strategies are always indispensable for any organization.

There may be further motivations, such as exposure to skilled workforce pools, access to growing markets, capacity development, reducing time to market, fostering innovation, and enhancing efficiency and quality, in the case of engineering and design services. Engineering services, on the other hand, are distinct from other types of services, such as business process outsourcing or IT.

Engineering services have particular restrictions that make them less suitable for outsourcing or offshoring than other tasks. Understanding these distinctions is critical not just for achieving the anticipated efficiencies and savings associated with outsourcing, but also for the long-term health of the businesses that engage in it. The key distinctions between engineering and other services may be summarized by the various characteristics listed below.

2.4.1. Product Uniqueness:

Engineering services are often distinct. Processes and subprocesses differ according to firm, industry, and the goods for which engineering services are provided. For instance, the process of designing an automobile component will be distinct from that of developing a paper rolling machine or a mobile phone packaging scheme.

The order of the processes and the testing criteria vary and often distinct for each product line. In comparison, one might anticipate synergies in financial transaction procedures. For instance, bill payment processing or the process of resolving a customer service call through a contact center may provide more leverage potential than many technical operations. Back office business processes have a higher degree of consistency across clients and sectors. Once developed, such a method may often be repeated throughout a client base with few adjustments. On the other hand, engineering services demand specific skill sets and competencies from vendors. For instance, a supplier skilled in the design of automobile components may not be skilled in the design or calibration of paper press rollers.

2.4.2. Collaborative Nature of Engineering:

Unlike many other outsourced services that may be appropriate for certain firms, engineering is often a collective effort involving many functional areas. For example, product development and research engineers collaborate closely with organizations such as business strategy, sales, IT , procurement and marketing. These functions interact to ensure that items are delivered effectively to clients. This element of engineering must be evaluated prior to outsourcing or offshoring. By contrast, many business operations and IT outsourcing operations may be isolated inside a company to a single function or unit. The effect of switching engineering service providers is felt across the organization, and the cross-functional synergy and coordination necessary are quite complicated.

2.4.3. Domain Knowledge

Engineers demand specialized training and background due to their vital necessity for professional knowledge and competence. Along with engineering foundations, 'tribal knowledge' or subject expertise is critical for building and assessing products. Numerous parts of engineering may only be learned via experience. Consider the difference between applying the appropriate constraints during a Finite Element Analysis (FEA) and over-constricting the computer model - although both techniques may provide equal results in terms of failure to pass the analysis, the second technique also produces repeated illusory failures, resulting in over-designing and additional expenses. Defining the distinction begins to resemble more "art" than "science."

The more exposure an engineer has to developing, analyzing, and testing in a specific environment, the more learning the engineer obtains within a particular working environment. Similarly to acquiring knowledge via hands-on work, the formation of best practices and the transmission of specialist information to succeeding generations of engineers add to the difficulty of outsourcing engineering activities. These technical characteristics also limit the activities that freshly minted engineers may accomplish.

While outsourcing business operations and IT may need specific training, professional knowledge is not vital as it is for ESO. In comparison, certain degree qualifications may be necessary to offer outsourced engineering services, and these services demand comprehensive and detailed understanding among client and company.

2.4.4 Market Demands:

Customers' expectations for ESO vary significantly around the globe. For example, vehicles are driven left-handed vs right-handed, product sizes, packaging regulations, and consumer safety norms vary throughout North America, Europe, and Asia. Products must be developed uniquely for each of these markets. Additionally, the methods, sub-processes, and testing criteria for product introduction differ. For some services, such as business process outsourcing, the differences across markets are less pronounced, partly due to the ordinary customer does not touch or feel the product. The average customer is unaware of or unconcerned about how a credit card transaction is performed. On the other side, clients may touch and feel outsourced engineering goods.

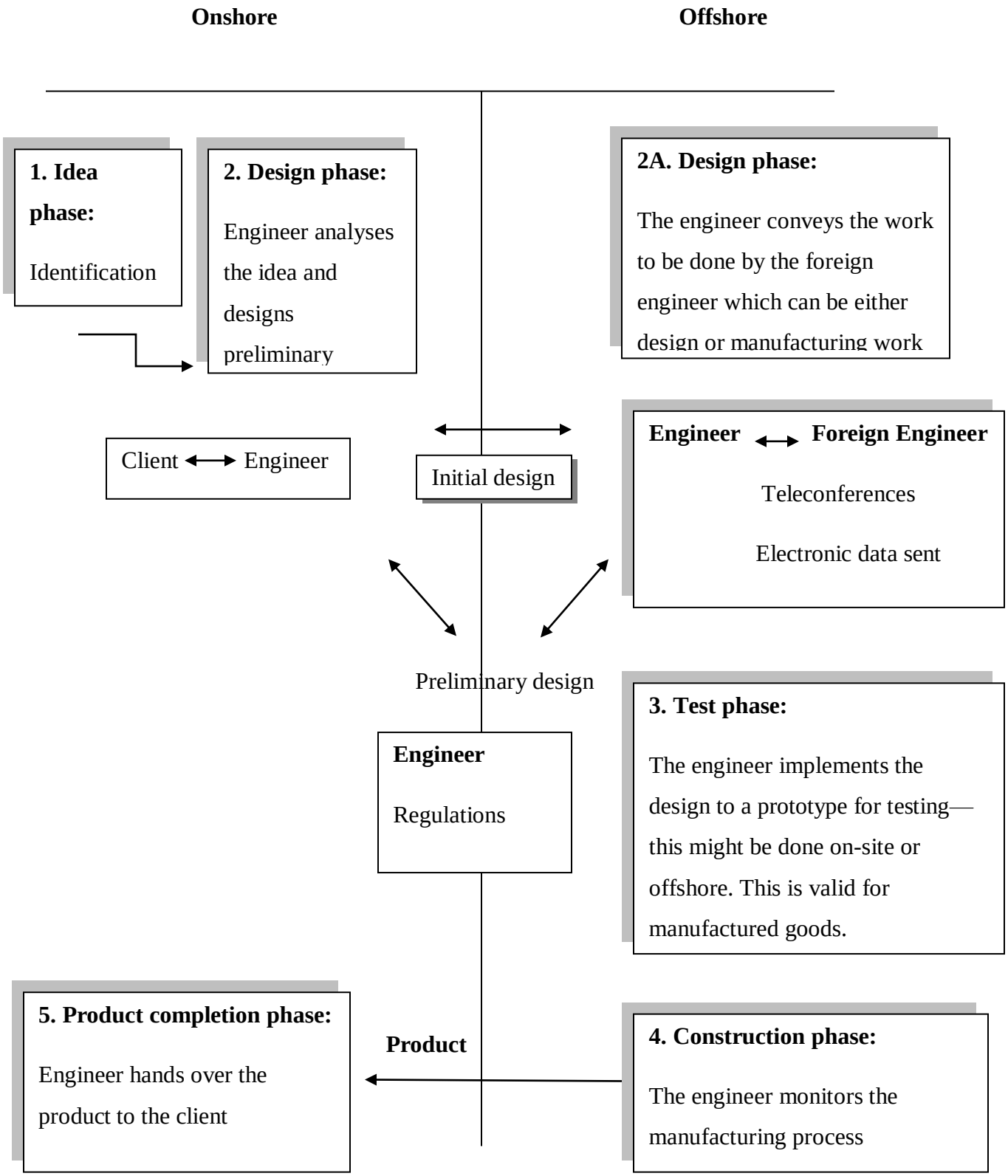
2.4.5 Vendor Capability:

Owing to these distinct characteristics and the critical need of domain expertise, engineering capabilities are difficult to come by at off-shore sites. It takes time for service providers with delivery centers in developing areas to acquire a strong technical capacity. This is partially due to the fact that client requirements in developing countries are somewhat different from those in developed ones. As a consequence, these service providers are learning at a slower pace than their counterparts in developed markets. Additionally, government laws aimed at avoiding global competition actually impede the formation and maturity of an indigenous engineering supply base in several developing nations.

2.4.6 Other Factors:

Additional criteria such as language, education quality, capacity to scale up resources, local legislation, and respect for IP, among others, take on a different relevance in engineering services outsourcing than in other forms of outsourcing. For example, IP problems are often more critical for ES than they are for business operations that do not provide the client with a competitive edge in the market. Additionally, the capacity to scale up resources is critical to the effective execution of offshoring engineering services.

2.5. Framework of Engineering Services Outsourcing model which includes both on shoring and off shoring



The above framework relates to the engineering services related to the **product development**:

Idea Phase:

Here, the client gets an idea about a new product which might be to solve a particular problem or is a new utility all together.

Design Phase:

- Here, the client appoints an engineer to whom the client narrates the idea/problem. Based on this the engineer prepares a initial design and estimates the requirements for the project in terms of software, hardware, intellectual capital, number of man-hours your project process requires etc.
- After this the specific components of the project are identified. Decision is to be taken as to which activities need to be performed on-shore and which activities can be off shored.
- An ESO is selected in some other country where a part of the designing or manufacturing process can be outsourced
- After that, an ESO Project Leader/Outsourced Process Manager (OPM) located in India is chosen and deployed on site for the project's initial few days. This Project Leader/OPM will oversee the team's offshore operations.
- After acquiring a detailed understanding of your aims and objectives, the Project Leader/OPM will choose remote team members, develop effective strategies, and establish specifications for the associated project milestones. A communication channel and reporting system will be built to ensure that the client is always aware of what has been completed and what remains to be achieved.
- Finally, the project leader will return to his country to direct all activities of the team.

Test phase:

The engineer transfers the design to a prototype for testing, which may be done on-site or offshore. This implements the developed product. It is not applicable for projects such as software development.

Construction phase:

Client’s engineer supervises the manufacturing process domestically or abroad.

Product completion phase:

Engineer hands over the product to the client which can be then commercialized.

Risks involved in Outsourcing Engineering services are tabulated below in Table: 1

Type of Risk	Risk	Non-Contract Risk Mitigation	Contract Risk Mitigation / Liability Allocation
Business Risk			
	Quality – Ensuring that quality of engineering services and deliverables meet or exceed required quality standards for use by the business	• Due Diligence • Process Definition • Specifications • Testing (where retained by the Customer)	• Specified Delivery Centers • Required Engineering Standards • Defined Engineering Processes • Warranty that Deliverables Conform to Specifications • Covenants re Service Performance • Minimum Staff Qualifications • Testing (consequences of testing failures) • Quality Service Levels o Defect Rates o Rework Percentage o Other
	Cost - Ensuring that the cost of the services fall within expected budgets. Ensuring that the prices for the services be the lowest available for comparable quality, type and scope of service	• Dual Sourcing Model • Pilot Projects • Alternative Sources of Supply	• Milestone Payments • Rework Pricing • Project Specific and Aggregate Performance to Budget service levels • Governance • Most Favored Customer Pricing • Benchmarking

Type of Risk	Risk	Non-Contract Risk Mitigation	Contract Risk Mitigation / Liability Allocation
	Timeliness – Ensuring that the timeline for service performance will meet the Customer's expectations.	• Dual Sourcing Model • Pilot Projects • Alternative Sources Supply	• Forecasting • Project Specific and Aggregate Timeliness service levels • Governance
	Availability – Ensuring qualified, trained staff available for projects.	• Dual Sourcing Model • Alternative Sources of Supply	• Forecasting • Knowledge Transition • Retention and Availability service levels • Rework • Qualified Staffing Covenants • Restrictions on Contract Staff Competition
	Forecasting – Ensuring that the Company can provide accurate and timely forecasts for planning purposes.	• Internal Governance • Demand Management	• Retention and Availability service levels • Work Flow Process • Governance
Legal Risk			
	Personal Injury – Risk that a person may be injured by a defective product, equipment or process.	• Due Diligence • Safety Policy and Procedures • Training	• Staffing Qualifications • Policy and Procedural Compliance • Quality Covenants • Indemnification for Third Party Claims
	Damage to Property – Risk that property may be damaged by defective product, equipment or process.	• Due Diligence • Safety Policy and Procedures • Training	• Staffing Qualifications • Policy and Procedural Compliance • Quality Covenants • Indemnification for Third Party Claims

Type of Risk	Risk	Non-Contract Risk Mitigation	Contract Risk Mitigation / Liability Allocation
	Negligent Design – Risk that provider's design will be negligent.	• Due Diligence • Safety Policy and Procedures • Training	• Staffing Qualifications • Policy and Procedural Compliance • Quality Covenants • Indemnification for Third Party Claims
	Misappropriation of Intellectual Property – Risk that the service provider will misappropriate the company's intellectual property and use it for unauthorized purposes.	• Due Diligence • Service Provider Reputation • Governance	• Intellectual Property Rights Allocation • Confidentiality Protections • Security Protections • Restrictions on Work for Competitors
	Intellectual Property Infringement – Risk that a third party will bring a claim of infringement against the company for work product or deliverables created by service provider.	• Due Diligence • Service Provider Reputation • Governance	• Warranty of No Knowledge of Infringement • Indemnification for Third Party Claims
	Legal Compliance – Risk that Services are not performed in compliance with applicable laws and regulations.	• Due Diligence • Internal Compliance Analysis • Service Provider Reputation	• Conformance with Customer's Engineering Standards • Compliance with Law Related to Performance • Matrix of Compliance Tasks and Task Allocations • Indemnification for Claims Arising from Breach of Compliance Obligations

Type of Risk	Risk	Non-Contract Risk Mitigation	Contract Risk Mitigation / Liability Allocation
	Co-Employment – Risk that under local law, provider employees can claim co-employment benefits from the company.	• Do not Manage Service Provider Staff • Do not Direct Service Provider Staff • Govern at Manager to Manager Level	• Governance • Allocation of Direction/Control over Contract Staff • Indemnification for Co-Employment Claims
Sourcing Risk			
	Transition – Risk that the company's process/knowledge not effectively communicated to service provider.	• Pilot Engagements • Prior History • Dual Sourcing Model	• Transition Plan • Availability and Performance service levels • Transition Assistance upon Termination/Expiration
	Knowledge Retention – Risk that the company loses institutional knowledge.	• Retained Organization • Governance	• IP Ownership Provisions • Data Control Provisions • Transition Assistance upon Termination / Expiration
	Relationship Management – Risk that the relationship breaks down.	• Due Diligence • Dual Sourcing Model	• Contract Management • Governance • Dispute Resolution

2.6. Engineering services outsourced in various branches of Engineering

Aerospace Engineering

- Aerospace Engineering Services Outsourcing:
- CAE Services
- Tool Design
- Product Design & Development
- Aero Engines –Engine Design & Analysis
- Aero Structures - Engineering Design & Development Support for
- Design Support Services for Other Areas

Civil Engineering Services Outsourcing

- Transportation Design Analysis
- Construction Drawings
- Structural Engineering
    - Behavior of Metal Structures
    - Design of Concrete Shells
    - Advanced Matrix Analysis of Structures
    - Dynamic Design of Structures
    - Reliability Assessment of Structures
    - Structural Steel Design
    - Reinforced Concrete Design
- Electrical & Plumbing
- CAD Services

Electrical Engineering Services

- Design of Lighting Systems
- Design of Power System
- Determining Earth Protection Requirements
- Design of Fire Protection System

Electronics and Communication Engineering

- Front-End Engineering

  - Mixed Analog/Digital Designs
  - Bluetooth and Wireless Designs
  - High Speed Digital Designs
  - Video Graphics

- Hardware Engineering

  - Network Interfaces
  - Schematic Tools - Amplifiers, Filters, Semiconductors, Converters
  - Processors

- Electronic Interfaces and Design

IT and Computer Engineering Services

- Software Code Translation
- Content Management
- Engineering Software Design & Development
- Application Development & Maintenance
- Database Management Services
- Data Mining & Warehousing

2.4.0. Design of Chips, Circuits

- Network & Information Security

1. Information System Security
2. Cryptography

- Web Based Collaborative Engineering

- Knowledge Based Engineering Solutions

- Hardware Integration
- Embedded Systems
- Real Time Systems

- Artificial Engineering

Mechanical Engineering Services

- Equipments

    - White Goods
    - Automotives
    - Special Purpose Machines
    - Turbo machinery
    - Heavy Engineering
    - Agriculture Machinery
    - Machine Tools
    - Tooling
    - Earthmoving Equipment

- Mechanical Animation Services
    - Animation of Assemblies
    - Animation Showing 3D Sectional Views
    - Animation From 2D CAD / Scanned / Hand Drawings

- Mechanical 3D Modeling Services

    - 3D Assembly & Rendering
    - 3D Sectional Views
    - 3D Modeling from 2D CAD / Scanned / Hand Drawings

- Mechanical 2D Drafting Services

- Fatigue And Failure Analysis

2.7. Description of various IT Engineering services

- **Engineering Software Design & Development**

  Software development (alternatively referred as development of design, applications and platform) is the process of developing a software product.

  Software may be developed for a number of reasons, the most frequent of which are to satisfy the unique demands of a particular client/business (as is the case with proprietary software), to fulfill the perceived requirements of a subset of possible users

- **Content Management(CM)**

  A CM system is a set of processes that are used to regulate work flow in a team manner. These operations may be performed manually or via the use of a computer. The processes are intended to accomplish the following goals:

  - Allow for a large number of people to contribute to and share stored data
  - Control access to data, based on user roles (defining which information users or user groups can view, edit, publish, etc.)
  - Aid in easy storage and retrieval of data
  - Reduce repetitive duplicate input
  - Improve the ease of report writing
  - Improve communication between users

- **System on Chip(SOC) design**

  System-on-a-chip or system on chip (SoC or SOC) refers to integrating all components of a computer or other electronic system into a single integrated circuit (chip). It may contain digital, analog, mixed-signal, and often radio-frequency functions – all on a single chip substrate. A typical application is in the area of embedded systems.

- **Network & Information Security**

  The term network security and information security are often used interchangeably. Network security is generally taken as providing protection at the boundaries of an organization by keeping out intruders (hackers). Information security, however, explicitly focuses on protecting data resources from malware attack or simple mistakes by people within an organization by use of data loss prevention (DLP) techniques. One of these techniques is to compartmentalize large networks with internal boundaries.

- **Knowledge Based Engineering Solutions**

  KBE can be defined as engineering on the basis of electronic knowledge models. Such knowledge models are the result of knowledge modeling that uses knowledge representation techniques to create the computer interpretable models. The knowledge models can be imported in and/or stored in specific engineering applications that enable engineers to specify requirements or create designs on the basis of the knowledge in such models.

- **Artificial Engineering**

  Artificial intelligence (AI) is the intelligence of machines and the branch of computer science that aims to create it. AI textbooks define the field as "the study and design of intelligent agents. Where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.

- **Real Time Systems**

  In computer science, real-time computing (RTC), or reactive computing, is the study of hardware and software systems that are subject to a "real-time constraint"—i.e., operational deadlines from event to system response. Real-time programs must execute within strict constraints on response time. The anti-lock brakes on a car are a simple example of a real-time computing system

- **Embedded Systems**

An embedded system is a computer system that is intended to execute a single or a few specific tasks, often under the limitations of real-time computing. It is embedded as a component of a larger device, which often includes hardware and mechanical components. In comparison, a general-purpose computer, such as a personal computer (PC), is built to be adaptable and suit a broad variety of end-user requirements. Numerous items in regular usage today are controlled by embedded systems.

PART 3: ENGINEERING SERVICES OUTSOURCING IN PRACTICE

3.1 Factors considered in selecting the activities to be outsources

Prior to deciding whether or not to outsource or migrate off-shore, it is necessary for businesses to do extensive studies of their domestic engineering processes and sub-processes. The following elements will aid in this analysis:

1. Transferability;
2. Maturity; and
3. Risk.

3.1.1 Transferability:

Before outsourcing an engineering task, each process must be examined for its practicability to, and ability to be performed, by a third party without requiring face-to-face contact. Processes that need considerable connection with the firm, its engineers, or other divisions of the business must be eliminated, since they are not suitable for outsourcing or offshoring. Such procedures face the risk of failing to capture the most recent client requirements and/or adjustments made by other functional areas within the business.

Moreover, if the process requires numerous judgment calls by the engineer executing the job, outsourcing such an activity is very inefficient, since the service provider's engineer would be needed to consult with the company's engineer whenever a decision must be made.

Additionally, remotely administering engineering procedures that need hands-on evaluation and the actual participation of engineers at the firm's location is very challenging. Offshoring such procedures creates logistical challenges for administering and controlling the activity. Before outsourcing or offshoring engineering processes, their applicability must be determined.

3.1.2 Maturity:

To effectively outsource or shift an engineering process off-shore, it must be properly defined, process-mapped, documented, and standardized. Typically, a sophisticated engineering process does not need the collaboration of several functional units within the enterprise.

However, a process with inadequate documentation indicates that there may be various ways to do the work and that the information or data necessary to execute the activity may be stored in numerous locations within the organization. If collecting the essential information is a time-consuming operation when performed internally, trusting a vendor to do it is problematic.

Additionally, if there are no established standards for executing a process, the procedure may be executed with variable outcomes each time it is conducted. To hire a third party to undertake that work, the engineer's memory must be extracted of the stages and sequential duties. Each of these features makes a process more difficult to communicate to an engineering service supplier and diminishes the likelihood of successfully outsourcing that activity. Outsourcing an immature process almost always ends in disappointment.

3.1.3 Risk:

Outsourced or off shored engineering procedures should also be risk assessed. The most significant danger is the loss of intellective capital — both tangible and intangible IP. Due to the particular nature of engineering, businesses that outsource engineering operations must exercise caution to safeguard their intellectual capital. Additionally, very complicated engineering procedures introduce enormous transition risk. For instance, an engineering operation that has the ability to consume a crucial amount of a expertise engineer's work for an extended timeframe in order to mitigate the risk management. Additional risks include accountability for substandard or faulty projects, warranty obligations to third parties, and reputation damage linked with substandard goods or processes.

3.2 Considerations used to determine Captive or Vendor:

There are several business models that organizations that outsource or off-shore engineering tasks use in reality. There is no one-size-fits-all answer. Each business model should be customized to match the company's strategy and goals.

The organization’s short and long term plans, the sorts of engineering activities being outsourced, and the viability of those services for outsourcing all play a critical role in defining the appropriate economic model for outsourcing such operations. For instance, if a company's long-term objective is to achieve equilibrium in engineering operations in order to service high-cost areas from an off-shore site, therefore an organization needs to develop a proper plan of action as per the requirement.

The following is an example of how to think about outsourcing and offshoring engineering activities. Processes that are very mature are often the ideal candidates for outsourcing and offshoring since they are fully defined, standardized, and documented by definition. Their implementation is lacking of diversity and ambiguity, if at all. If any mature operations incorporate proprietary techniques – information – or data connections, these processes may be regarded "high risk" and are best handled in a company-owned off-shore captive center. Typically, a captive center is wholly or partially owned by the corporation outsourcing the engineering effort. Mature and low-risk engineering processes are the greatest candidates for outsourcing and offshoring to engineering service suppliers (i.e., third party vendors).

3.3 Key pointers in selecting the right partner for providing engineering off shoring services:

After identifying ES for outsourcing or offshoring, businesses should spend time evaluating the abilities of the suppliers who would best fit their plan. Prior to selecting a partner, it is vital to do a comprehensive evaluation of the vendor base. While this stage may seem self-evident, there are several instances of broken partnerships and dissatisfied customers and suppliers as a result of firms being too quick to choose a provider perform the potential analysis for proper outsourcing services.

The five-step procedure shown below is representative of the technique that businesses may choose to adopt when selecting a service partner.

Step-1: Evaluate the supplier's skills and short-list of capable candidates which can work with technical expertise or brand awareness.

Step-2: Conduct a pilot test(s) on the short-listed suppliers (from step 1) and assess their performance. The pilot test(s) should be reflective of the issues that would be resolved during the execution of outsourced services. Refine the list of qualified suppliers who matched pre-defined performance targets.

Step-3: Visit the short-listed (step-2) vendors' operational centers, i.e., the place where the planned activities will be carried out, to conduct thorough research on the vendors' abilities and to inspect their facilities in person.

Step-4: Prepare a (RFQ) from the short-listed suppliers for the engineering tasks that will be outsourced or off-shored and assess them.

Step: 5 choose the appropriate supplier partnership based on the results of the evaluations done in steps 1-4.

3.4 Contractual issues in Engineering Services Outsourcing

3.4.1 Scope of Service

Outsourcing successfully demands a well-defined scope of work. What precisely is the service provider required to do? What obligations will the business retain? These considerations are particularly pertinent in the context of ESO, when a full function or set of duties is seldom outsourced. Engineering operations outsourcing necessitates complicated relationships between the service provider and the client. For instance, even in long-standing outsourcing arrangements, businesses generally outsource single activities or projects to the service provider while maintaining management over the collective function. 5 Lines of demarcation and locations of contact must be obvious.

Responsibility allocations between service provider and business necessarily change from project to project. As is the case in other sectors, strategic functions, along with direct customer-facing activities, tend to stay inside the firm structure. 6 Routine transactions, as well as middle-tier tasks that follow regular procedures, are often suitable candidates for outsourcing. Due to the fact that businesses maintain significant obligations, the standard "sweep" (or "generic scope") wording used in other forms of outsourcing may be less sweeping. When businesses started outsourcing data centers years ago, the scope of service encompassed not just the project plan, but also accomplished IT budget. When isolated or chosen EDS are outsourced but the corporation retains control of the whole EDS, such broad phrasing may not be suitable.

Rather than that, the scope of the project for outsourced engineering services is often specified on a case-by-case basis. Additionally, the scope of the project is often specified in terms of the general work-flow procedures associated with a certain kind of project, rather than as a matrix distributing responsibility for a specific set of activities. The work flow procedure outlines the processes that should be followed while doing an outsourced engineering project of a certain sort. The parties may adjust this assignment of labor as required to meet the needs of a given project. The specific work plan for each project is then verified in the project's documentation.

Different kinds of engineering or design services often need distinct work flow methods. These processes may be a reflection of the company's regulations for executing outsourced task. Alternatively, the method may mirror that of the service provider. Typically, the process will be a hybrid based on the vendor to perform engineering work. Complicated projects includes several processes originating from a variety of different technical tasks. The critical prerequisite for effective project monitoring and completion is a distinct which is required to fulfill from the task offered by the organization.

As engineering outsourcing advances, parties may increasingly rely on job allocation matrixes more typical in conventional kinds of outsourcing, such as data center management. This applies in particular when parties desire to outsource a service provider to the whole engineering function. The management and maintenance of the design archives might be a role of this type.

The company may outsource a comprehensive array of responsibility for preserving and supporting a drawing inventory for the service provider, instead of allocating responsibility for collecting and maintaining design drawings in pieces or projects by project. In this circumstance, it is virtually clear that the work statement would define the tasks related to that area of work. Further, parties may agree that although the job is not included in the statement of work for this function, the task is included in the scope of the work of the service provider when it was done by the workers responsible for the archiving and preservation of drawings.

3.4.2 Transition

The transition from an enterprise to a service provider at the beginning of an outsourcing pact and from a service provider to the company or another provider at the completion of an outsourcing arrangement is to take responsibility for the project.

In the context of outsourcing EDS work is commonly outsourced on a project-by-project basis. This creates fascinating transitional issues for ESO. How much initial transfer of information is essential and how much transition of information needs to be included into each project? Second, how do company and service provider ensure the maintenance and distribution of transferred data to reachable service provider personnel by the service provider? Third, when the scope of ESO develops, how can the company preserve its interest to protect access to such information?

Knowledge supplied in general as part of an ESO contract includes functional and technical data about the products, services, facilities and machineries of a firm. It also demands a deep understanding of the organization's technical standards, techniques and rules. Outsourcing of engineering and design might pose substantial obstacles. Where these standards, methods and procedures are not extensively documented or differ among facilities or divisions, it might be exceedingly difficult to transfer this information.

To document and integrate these standards, regulations and procedures, enterprises with an outsourcing role might choose to carry out before outsourcing so that they may smooth the transition to the outsourcing model. In addition, requiring service providers as part of their service delivery promises to record such standards, regulations and procedures will help ensure that information will remain accessible as the scope of external services grows.

As previously indicated, an outsourced engineering service often startes with proof of ideas or beta-projects suited for the service provider to do without transferring the essential engineering standards, regulations and procedural skills to completed outsourcing. In the case of such a concept proof project that combines acceptable technical standards or norms, companies may often build a working package.

Alternatively, employees of the services provider may "shadow" employees while doing a "typical" project to familiarize themselves with the quality management systems for such work. This transition strategy may be effective when there are no specified technical standards or processes in the company or when the prospective service providers do not readily access these standards.

Job shadowing may cause immigration concerns if the service provider wants to hire foreign nationals to staff the project. For instance, how do foreign nationals enter the United States? Which visa programs allow them to work in the United States? What limits do their visas impose? Which regulations must the business adhere to? Certain service providers already have people in the United States to facilitate the transfer. Others may ask their consumers for aid in getting visas and work permits. When speed is vital, customers and service providers must examine if visa concerns would cause a delay in transition. Businesses should ensure that the service supplier is accountable for compliance with all relevant immigration rules.

Transferring knowledge from the individuals executing the task to the service provider is an efficient strategy to assure knowledge transfer. On the other side, such a human movement may have an effect on the outsourced company's other commercial objectives. Due to the fact that employment regulations differ by jurisdiction, businesses and service providers should be aware of the potential influence of local employment laws on the outsourcing agreement. Where numerous sites are touched by local employment laws in numerous jurisdictions, the impact of local employment laws is likely to be diverse.

3.4.3 Service Levels Quality and performance are essential in outsourced engineering and design services, as they are in other outsourced activities. Consistency, precision, dependability, and accountability are desired by businesses, as are suitable punishments to dissuade bad performance. In the context of outsourced engineering services, service providers recognize this and go to considerable pains to build and maintain their procedures and reputations regarding the safety and quality of their solutions.

Along with due diligence on the service provider, businesses will pursue contractual solutions for quality concerns that fall short of desired standards. Frequently, these contractual solutions take the shape of quality measures or "service levels" in relation to the execution of the project. These service levels are classified into two categories: project-specific and aggregate project-level services. In the former group, service standards for individual projects will be determined by the QoS supplied on each outsourced job.

For instance, in the context of design drawings, the statistic may compare the proportion of accurate and timely produced design drawings to the total number of revisions required. Whereas, aggregate project metrics may be used to compare the proportion of projects finished under budget during a quarter to the total number of projects begun during that time period. As is the case with other kinds of outsourcing contracts, a proportion of the service provider's fee may be at risk if such service requirements are not met.

Consequently, service levels alone may not be enough in the case of ESO to give businesses with sufficient assurance that the ESO provider is taking an acceptable amount of care to prevent errors. This is especially true when the business is relying on the service provider to produce a result that will have a substantial effect on the organization. For instance, if a corporation outsources the delivery of a material capital project, errors or delays might have a negative effect on output that service levels cannot appropriately address.

A design error in a manufacturing drawing might result in liability concerns that service levels cannot effectively resolve. Determining how to distribute these possible liabilities between the firm and the service provider poses issues that may not be resolved by other kinds of outsourcing's liability allocation procedures.

As a result of these considerations, businesses may conclude that the difficulty of defining and assessing service standards outweighs the advantages of adding them in project-based outsourcing services contracts. Establishing initial service standards presents difficulties, since very few businesses have assessed their own performance in the thorough or rigorous manner that they intend for the service provider. Without a track record of prior success, service providers are hesitant to commit to precise performance goals. As a result, setting service standards might be challenging.

Measuring performance versus established service standards may sometimes be challenging. In comparison to other kinds of outsourcing, performance measurement tools may not be easily accessible.

Additionally, unlike other types of outsourcing, which involve the transfer of a complete function to a single provider, ESO deals may be designed such that project responsibilities are competitively tendered to a pool of competent service providers.

Companies may leverage competition to maintain pressure on pricing and performance quality by designing multi-source partnerships. If the quality begins to deteriorate, businesses might outsource the next job to a different service provider. Competitive pressure may be a more effective motivator for performance quality than a service level regime.

To be fair, businesses insist on measuring and reporting some things, such as overall project performance versus budgets or timeframes. Even if cost reductions are not linked to non-compliance with specified minimal criteria, this information is valuable for managing the outsourcing partnership. Additionally, this information is beneficial in identifying areas for improvement. Often, this information benefits both parties by assisting in finding the core cause of performance breakdowns and resolving such difficulties.

3.4.5 Quality Warranties

In engineering and design outsourcing, quality guarantees are critical. As with its forerunners, ESO agreements must include at least two distinct approaches to quality: service performance quality and deliverables or consequences of performance quality. This discrepancy in quality guarantees presents intriguing questions in the context of professional services contracts.

This is particularly relevant in the case of professional services agreements in which the provision of products or capital is a substantial component or result of the services. Given the nature of ESO, this duality will persist as long as expertise services engagements are organized as outsourcing arrangements. Is the service provider accountable for a certain outcome or just for functioning professionally? Or is it both? While the former is a strict liability requirement, the latter is not.

Given this contradiction and the need to prevent misunderstanding about the parties' intentions, ESO agreements should identify the applicable quality standard(s). Given the breadth of services available via an outsourcing arrangement, these quality criteria may encompass the following:

- Warranties of performance (e.g., professional and timely execution in compliance with the highest industry norms)
- Warranties of specific results (e.g., distribution of a job duties that is appropriate for a specific purpose or investment on capital equipment that meets specified standards by a certain timeframe)
- Staffing warranties (e.g., performance by duly qualified and experienced staff).

In the absence of clear agreements on the basis of the relevant warranties, the court may impose implied guarantees. In the case of ESO, a tribunal may suggest Warranties of performance, requiring the service provider to deliver the services to the same level as other specialists. This guarantee is not conditional on the attainment of any certain outcome. Therefore, if the organization expects a certain output, this should be explicitly mentioned in the outsourcing contract.

Additionally, the guarantees provided by the business and its representatives to the outsourced service provider need particular scrutiny. The corporation may issue explicit guarantees to the service provider in particular cases. For instance, a business may declare that it has the authority to transmit to the service provider design drawings that are in its possession.

Additionally, the firm may issue implicit promises to the service provider, which are applicable until the firm disclaims them. For instance, a business may issue implicit assurances that the design drawings it provides to a service provider are adequate for the assembly of a certain piece of equipment. In such situation, provided the service provider adheres to the design drawing, the corporation may assume the risk that the machinery under development will accomplish a certain task. If the business does not intend to issue such guarantees, they should be expressly disclaimed.

Because the firm normally does not have control over the service provider's personnel choices (controlling such choices makes the outsourced relationship seem suspiciously like co-employment), corporations may obtain assurances from service providers on minimum employee qualifications. These guarantees are meant to provide a minimum degree of quality by establishing educational, training, and experience requirements for service provider personnel conducting outsourced services. It is critical to understand how such minimal credentials may be influenced by disparities in educational systems and demography when considering offshore outsourcing. Additionally, it is critical to examine which licenses, if any, should be needed of in-scope personnel. These standards vary significantly depending on the kind of job being outsourced, the jurisdiction in which it is performed, and even the specific project being outsourced to the service provider.

3.4.6 Pricing

Due to the fact that people are the key cost component, ESO are often priced in terms of headcount (usually stated in terms of "full-time equivalents" or "FTEs"). Additionally, pricing may be determined by time and materials. Typically, the parties would set a budget estimate for a specific project based on the project's complexity, manpower required, and anticipated schedule. vendor may include material costs in their budget projections, the firm may acquire materials, or the corporation may pass on material costs.

Even when headcount is anticipated to account for a substantial share of the expenses, parties should explicitly assign responsibility related to finance. Is time spent correcting an incorrect shipment chargeable? Or is such time considered non-billable? How is non-billable time separated from billable time if it is not billable? What documents, if any, must the vendor keep to verify headcount charges? Identifying and resolving these problems is critical when the firm lacks insight into the service provider's delivery organization. In an ideal world, service provider prices, corporate rates, and service volumes are all successfully linked. However, pricing metrics must be carefully set to match the value supplied. For instance, the corporation should not be charged for several modifications to remedy earlier errors.

Similarly, fixed pricing may be suitable in highly mature situations. Before accepting fixed-price contracts, service providers often need very extensive scope definitions and change control methods. Fixed pricing may be appealing to both businesses and service providers if tasks are repeatable and measurable. However, under such circumstances, service providers should be motivated to continue driving costs out of their delivery organization. Maintaining competitive pressure via multi-supplier sourcing methods is one way to preserve such rewards even on a set price basis.

3.4.7 Compliance with Laws

Engineering and design services are governed by both general business rules (such as OSHA) and industry-specific rules and regulations (such as FDA, HSA or other regulatory bodies). Even when activities are outsourced, regulatory duties cannot be transferred, but businesses seek security from outsourcing vendors. Supposed differences between regulations that apply to one party or the other are seldom precise, since a large number of laws apply to both the corporation and its vendor. To navigate this labyrinth, a legal matrix and obligations are beneficial, as it guides the parties from shared knowledge to rational allocations of supervising compliance, in case of difficulties, culpability, based on their unique abilities and capacity to supervise legal changes and risks mitigation..

Where the business has compliance responsibilities (as it does in many regulated sectors), the parties may protect themselves by adopting comprehensive written rules that the service provider must follow. These processes must be certified by the business's attorneys. vendor who reject providing legal advice will typically agree to adhere with the company's policies and procedures and will be held liable for any violations. Most acknowledge that they must also be conversant with and adhere to regulations of broad applicability that impact many businesses.

Outsourcing EDS to offshore service suppliers may generate export control compliance concerns, especially if the knowledge or materials covered by the outsourced function are restricted for export. Provision of such regulated items to foreign nationals inside the United States is regarded to constitute an export under US law. Offshore vendor are therefore only allowed to access data in the jurisdictions where they have a license, even though no information has ever been over a border. To allay worries about export of data, project delivery may be organized in such a manner that only approved vendor workers may work on it. Alternatively, businesses or organizations may purchase the necessary export licenses in order to authorize the transfer of certain sensitive information to certain permitted persons, and then comply with the licensing regulations for any exports or potential exports of such content or materials.

3.4.8 Security and Confidentiality

Outsourced EDS providers may have access to some of their customers' most sensitive commercial, financial, and technical data such as manufacturing costs, new product plans, and secret trade data which is valuable to rivals and might result in considerable harm to the client if leaked.

Businesses must consequently pay special attention to security procedures and risks such as service provider staff allocated to the company's account performing services for rivals. 10 No firm wants the account executive of the service provider to be moved to one of its rivals' accounts, at least not quickly, or its data to be commingled with rivals' data in a manner that may mistakenly result in illegal disclosures. Neither does a business want to learn that the solution given by outsourced engineering professionals is contaminated as a result of their work on a competitor's project. Dedicated workers or separate, secure working rooms inside the service provider's facilities, on the other hand, are likely to incur additional costs.

There are many strategies for addressing security and confidentiality concerns in ESO agreements. To begin, the business must do proper research on the vendor’s confidentiality. Established vendor should anticipate this vigilance and be prepared to demonstrate a strong commitment to confidentiality and security. Additionally, the outsourcing agreement should contain unequivocal assurances from the vendors that sensitive customer data will be utilized as private and that the vendor will take reasonable steps to safeguard such information.

When company employees' confidential information is accessed by offshore outsourcing vendors, and/or there is a high risk of theft, organizations should directly engage providers rather than use confidential agreements. The time and administrative complexity of directly obtaining confidential agreements from provider. Agreements may be challenging to keep since provider staff change often. Another view is that having these agreements with providers helps to protect the company's confidential data. While non-disclosure pact may also benefit in managing customer security.

To safeguard the business's valuable information, the business may opt to sign into a second non-disclosure pact with the subcontractor that involves both the service provider and the subcontractor as well. A bilateral agreement puts the corporation in a better position to bring an injunction in a foreign jurisdiction against the subcontractor. Non-disclosure pact may be easily enforced if they are subject to the local laws of the offshore jurisdiction. To find out whether a non-disclosure agreement may be enforced and whatever local laws it follows, one needs first contact a local lawyer to find out.

3.4.9 Non-Compete

Along with proper research and contractual constraints against the publication of secret information.

One justification for such non-compete agreements is to safeguard the company's confidential information from eventual exposure. However, a significant downside of such limits is the detrimental impact they have on the vendor’s ability to harness knowledge across several organizations and to assign specialists to protected accounts. When such limits are agreed upon, they are often confined to prohibitions on reassigning in-scope employees to rival accounts for a certain length of time. In other instances, the limitation may apply exclusively to a small number of senior executives.

Local employment rules and practices may render non-compete agreements with specific employees invalid in offshore delivery centers. Covenants from the vendor not to transfer specific resources to rival accounts may be the strongest security a firm has against the unavoidable leak of private information in certain cases. Whenever parties agree that experts should or must be authorized to work for rivals, firms may demand that information flows to such experts be controlled to prevent disclosing customer confidences where practicable.

3.4.10 Compliance – Controls and Audit

The primary focus of ESO is excellence, responsibility, security, and punctuality. These controls are usually based on the company's technological demands, industry standards or the best practices of the service supplier. In EDS outsourcing markets, these controls are crucial since they offer the agreed boundary within which the supplier has to work. These constraints offer the company with a way to manage delivery, which the service provider would otherwise be given over. It is useful to link these controls to the services provider's processes in certain circumstances. The mapping methodology allows the Company to guarantee that its control objectives are achieved even if the controls rely on the practice of the service provider and not the company.

As noted above in the scope of work, engineering controls may include mandatory control points (or gates), client reviews, licensing laws, permit regulations, supplier reviews, and test procedures in the service description. Businesses typically ask providers to explicitly preserve records to verify that such measures are maintained. Companies should undertake the service supplier's quality assurance research to determine the internal control and the history of the service supplier's compliance with these checks. In addition, companies may need continuous testing and documentation to guarantee the working of the controls.

Along with well-defined controls over engineering and design services, businesses should maintain the power to audit service providers' compliance with such rules, either directly or via third parties. In certain outsourcing situations where delivery platforms are heavily exploited, service providers may include in their service offering third-party audit reports on control compliance. As part of the company's deep research, requesting access to such audits may assist in finding credible service providers.

3.4.11 Intellectual Property (IP)

It is vital to assign ownership rights to intellectual property originating from EDS outsourced agreements. Both businesses and vendors are interested in the quality of their work. Organizations may demand ownership of IP developed by a project, especially if the project is critical to the company's business and the corporation is supporting the EDS entirely. Rather than that, unless the parties expressly agree otherwise, current law allows the service provider to maintain ownership rights in such intellectual property.

In certain situations, it may benefit both parties for the service supplier to maintain ownership of IP generated during the execution of ES or drawing services, provided the firm secures wide and unrestricted permissions to exploit the work result. The vendor may be in a stronger position to exploit that IP in order to harm the business. For instance, if a vendor is creating a component for a device that would offer the firm with competitive benefits, preventing a rival from getting licensing rights in or to that design may be a business objective.

As a result, contracts for the supply of EDS outsourcing services must be crystal clear about intellectual property rights ownership. In certain situations, this may require the service provider to expressly convey intellectual property rights to the firm. In other cases, especially if services are provided from remote places, such allocations are needed for the establishment of the IP.

To address such needs, ESO agreements often contain extra assurance provisions in which the vendor undertakes to perform whatever assignments required to accomplish the contractual distribution of IP rights without charging extra fees.

Companies that outsource services must also consider the larger consequences of foreign variances in IP regulations. IP law is geographical in nature. As a result, the law regulating IP ownership is often the law of the country in which the IP is produced, rather than the law of the country in which the firm is incorporated or even the contract's governing law. Certain countries have default provisions in their baseline IP law systems that are inconsistent with US legal standards. Understanding the challenges presented by such underlying legal concepts is critical for correctly structuring the engineering services outsourcing contract in order to accomplish the parties' anticipated IP distribution.

Along with a clear distribution of rights, it is critical to address the methods that the parties will use to appropriately recognize patentable innovations that may be developed when providing EDS. This procedure should include the collection, storage, and transfer of pertinent technical notes, research results, and other pertinent material. Otherwise, especially when services are delivered abroad or from faraway areas, it may be impossible to enforce IP rights allocation. Businesses may have difficulty enforcing the additional guarantees clause if they are unaware of the service supplier's terms.

IP Disclosures

To be successful with outsourced engineering services, businesses and service providers must be able to communicate huge amounts of data, the majority of which will likely be protected by IP rights. To allow the exchange of this information, each party will very certainly be required to give the other party limited use of such rights, transfers and reproduce such information. Service suppliers in different cases may choose to integrate pre-existing vendors or third-party technologies. Where such pre-existing or non-existing technology does not transfer into an enterprise, the enterprise must enable the use of the deliverable for its intended purpose via sufficient rights within and to that vendor or third-party information. Companies may face limits on their ability to use or divide deliverables without adequately structured cross-licenses. Likewise, the capacity of services organizations to transfer IP to foreign subsidiaries or sub-contractors might be restricted.

Additionally, businesses may find it essential to supply IP licensed to them by third parties to their service providers. The contract for outsourcing should specify who is responsible for acquiring such consents. Occasionally, the corporation may be best placed to secure such consents. Whereas, the vendor may be in a stronger position. In any case, identifying and distributing responsibilities for getting such consents is often a required activity prior to initiating the outsourced services. Where such IP is to be moved abroad or made available to foreign people, third-party providers may demand additional safeguards to secure it. As a result, businesses are recommended to start this examination as early as possible in their due diligence process.

3.4.12 Subcontractors

Subcontractors, like other kinds of outsourcing, often play a significant part in the execution of ESO. When services are supplied overseas, it is not uncommon for the service provider to outsource key delivery responsibilities to an offshore captive subsidiary. Both parties often anticipate such a delivery arrangement. In other instances, the service provider will outsource deliveries to unrelated vendors located abroad. In any scenario, the service provider is responsible for the provision of services, confidentiality, and IP rights. Due to the sensitive nature of outsourced engineering services, businesses often want transparency and authorization rights over subcontracts, at least when such subcontracts cover a significant amount of the services being supplied. Without permission, the administrative operations may be subcontracted, unless the subcontractor has access to customer sensitive information in order to provide the services.

3.4.13 Taxes

Just like other outsourced services, both parties must evaluate the effects of potential taxes on the services, taxes withheld from payments, and the danger of establishing taxable "permanent establishments" when none already exist or are planned. Tax expenses may be a significant factor in determining the overall cost of outsourcing engineering and design services, depending on the countries involved.

Contract structures, delivery mechanisms, and invoicing procedures should be designed to reduce the transaction's total effective tax cost, but must also take into account the company's and service provider's pre-existing or prospective tax intentions. The administrative burden associated with various contract arrangements must also be considered.

In certain cases, tax planning may necessitate structuring the transaction to allow for local-to-local billing. In other instances, the transaction should be regionally organized or conducted via a single client or service provider business. While there is no one tax-efficient structure for outsourcing engineering services, paying serious consideration to the tax implications of the transaction may help both parties minimize the overall cost of outsourcing.

3.4.14 Assists

One factor of outsourcing engineering services that is sometimes disregarded is the effect that outsourcing engineering services may have on the customs value of imported products. When a business outsources engineering services to an overseas supplier, the value of such work may be regarded a "assist" that must be added to the product's custom valuation upon importation into the United States. While the term "assists" may not apply when offshore engineering services are employed to build onshore manufactured goods, they may become a serious problem when engineering work for offshore produced goods is also acquired from an offshore supplier.

3.4.15 Termination Rights

Contracts for engineering and design outsourcing often include the standard range of solutions, result in termination, for both violation and "convenience." Frequently, the most controversial issue is the termination fee associated with a "convenience" termination (surely a misnomer, for termination is supremely inconvenient). In reality, these rights to terminate without "cause" are most often employed when the business is unhappy but lacks either certain grounds for default or the stomach for unpleasant processes. Businesses naturally desire smaller termination fees to reduce the associated pain and costs. Service providers want to be compensated and hence impose a costly deterrent. Termination charges often include shutdown expenses (such as severance and relocation), unclaimed investments in buildings and machineries and maybe some provision for unearned gain on the remaining term. However, since engineering outsourcing transactions often do not entail significant investments in technology or infrastructure built specifically for a client, termination fees should be lower than in other outsourcing instances.

3.4.16 Disaster Recovery

Recent horrific tragedies, such as the September 11, 2001 terrorist attacks, Hurricane Katrina, and the 2008 Chinese earthquakes, have heightened awareness of the dangers of disasters-dangers that distance may magnify when activities are relocated to India, China, or the Philippines. Effective outsourcing contracts handle these challenges in two ways: via force majeure terms that excuse performance and may allow for termination if service is not restored, and via disaster recovery provisions that ensure supply continuity in the case of a catastrophic occurrence. When it comes to engineering outsourcing services, the critical factor is to return skilled workers to work as soon as practically practicable. Immediate recovery is not always required, as long as vital functions are recovered within an acceptable time period. Skilled personnel need work locations, modes of transportation, and access to data. Effective plans ensure that they include all three. Contracts for engineering and design outsourcing demand such plans, their frequent changes, and regular testing.

PART 4: PRIMARY RESEARCH

4.1 Exploratory research

- Exploratory research was done to understand the business model of IT Engineering Services Outsourcing model. This was done by conducting a **depth interview** of a **project leader** of one of the leading IT and Electronics outsourcing company based in Ahmedabad.

- The semi-structured questionnaire used for conducting the interview is attached in the following pages:

Questionnaire-1

Product

1. Which are the services offered by your company?
2. How do you classify these services (verticals)?
3. Please explain the approach to deal closing part of securing a project?
4. In cases where your company has capability for handling a part of the project and not the entire thing, do you go for subcontracting or have some other option?
5. How do clients decide which services to outsource?

Price

1. How is the pricing of the project done? Which all factors are considered? How is the entire business plan made?(fixed, part, hourly basis, flexible pricing)
2. Which are the major components of price?
3. What do you do in case of cost overruns (costs increase beyond expectations). When can this happen?

Place

1. Which are the main countries from which maximum clientele are obtained?
2. Why do these countries prefer India as a location for outsourcing?
3. Are there major differences between the types of requirements in various countries for similar services?

Promotion

1. Which are the major tools used for promotion?(Conferences, seminars, trade fairs, trade journals, direct mailing, etc)

People

1. How are the professional for a particular project decided? Does the client play a role in this?
2. Do you need to train your professionals for some projects?
3. Are any external consultants hired for some projects?

Process

1. Are there any constraints in deciding the processes to be used for the project being imposed by client or otherwise?
2. Is there a process for partial payment on the basis of the completion of the project in place?
3. How do you handle any errors/bugs that occur or service requirement after completion of the project?

Contractual Issues

1. How does the company decide how much information to part with related to the outsourced service and at what stage? How is the confidentiality and security of this information maintained?
2. If some professionals need to be transferred to the clients place, are there any legal problems that are faced in it? (related to visa or otherwise)
3. Are there any conditions for penalty or otherwise in case the solution provided by the service provider fails in any way? Are there any warranties for performance involved?
4. Are the intellectual property rights of the project retained by the company or shared between the client and the service provider?'
5. Are there any provisions for termination of contracts in the case when the work is unsatisfactory?

4.2 Understanding the business model of Engineering Services Outsourcing (through exploratory research)

4.2.1 Major services outsourced to the IT ESO companies

Following are the major services outsourced to the IT Engineering services company

- Application Development & Maintenance
- Content Management
- Database Management Services
- Engineering Software Design & Development
- Data Mining & Warehousing
- Software Code Translation
- Design of Chips, Circuits
- Network & Information Security
- Information System Security
- Cryptography
- Web Based Collaborative Engineering
- Knowledge Based Engineering Solutions
- Artificial Engineering
- Real Time Systems
- Embedded Systems
- Hardware Integration
- Image processing
- Product design and development using the combination of the above mentioned services

4.2.2 Major sources of lead generation

Following are the major sources of lead generation:

1. **Direct Sales:** This is the process of lead generation where the sales force of the company gets order from the existing or the new clients by directly approaching them. The companies generally have sales force in all the countries from which maximum clientele is obtained.

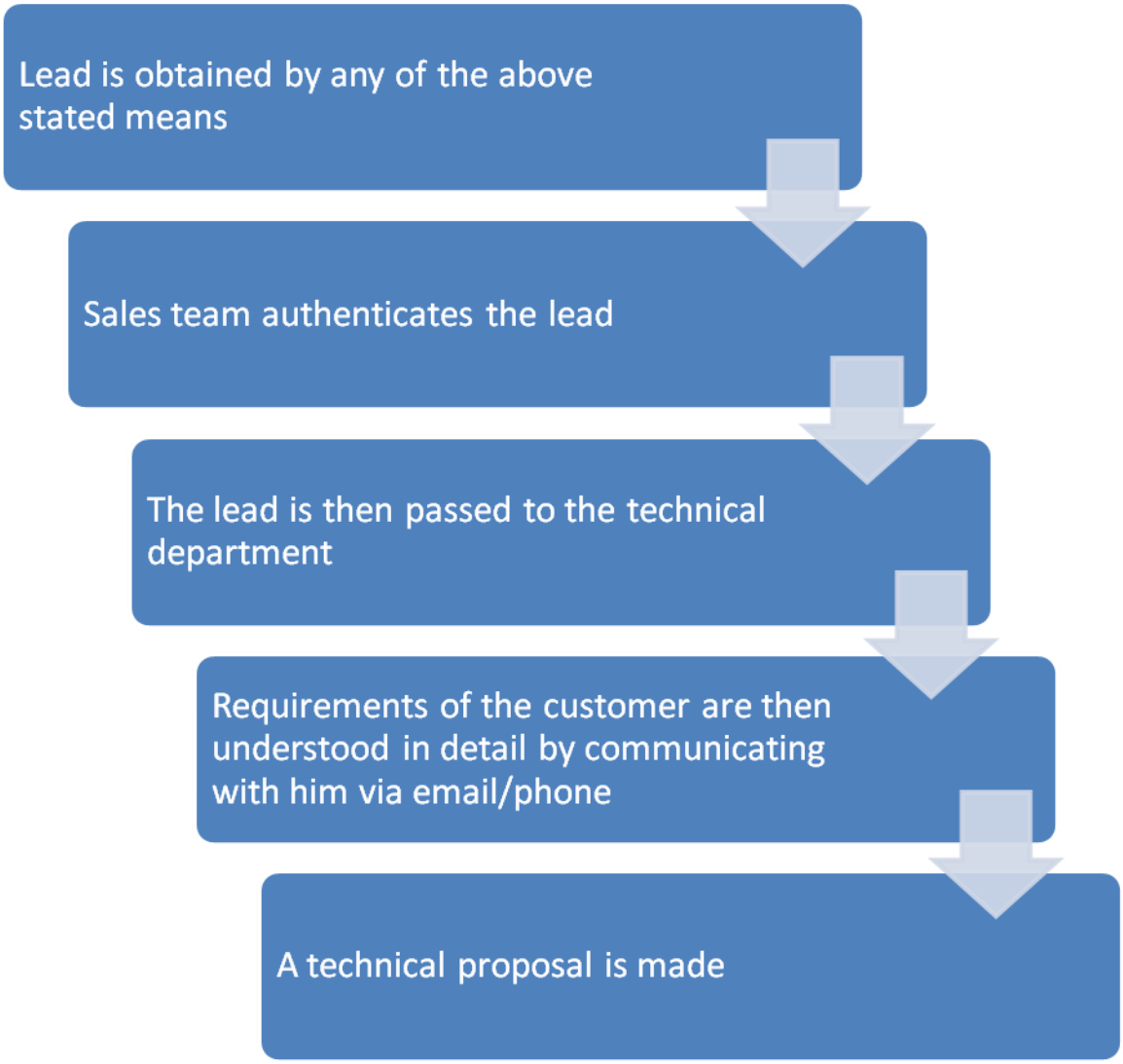
2. **E-mail inquiries:** Companies having the need of engineering services send email explaining their requirements to the company.

3. **Tender sales:** This source of lead generation is mainly for domestic projects.

4. **Partnership with the tool/product vendor company:** In this the OEM outsource some non-core activities to the Engineering Services Outsourcing companies on contract basis for a definite period of time.

4.2.3 Understanding the process of receiving a project:

Following are the various stages after which a Engineering services project is received



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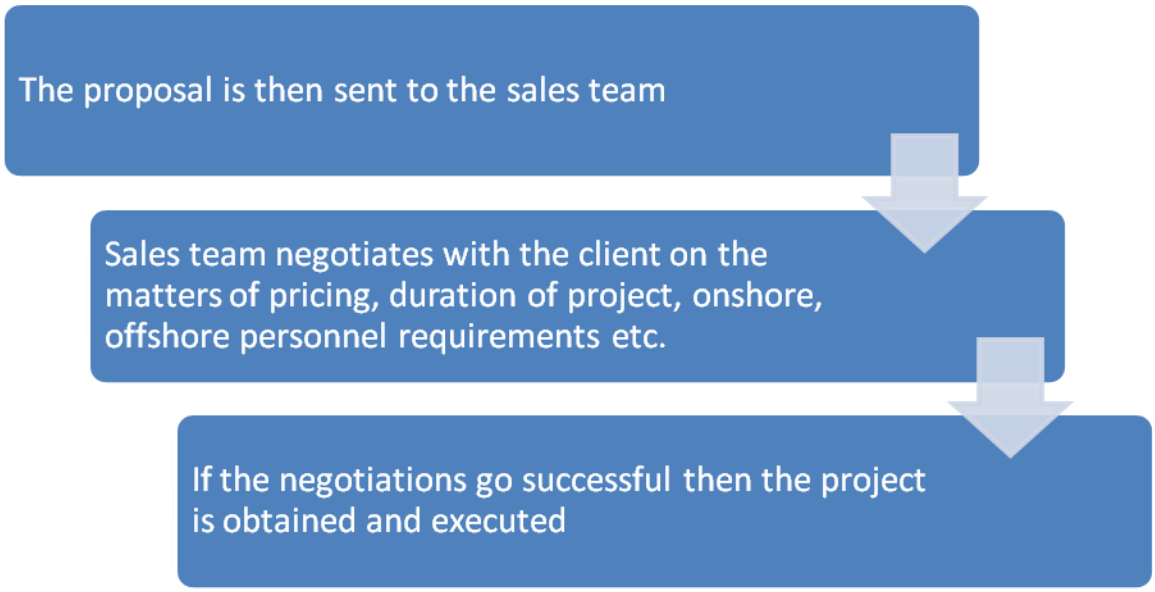


Contents of the technical proposal:

1. Similar projects handled before.
2. Requirements of various tools required for the project. Availability of those tools with the ESO vendor and the need to purchase them for the project. Price estimate of the tools to be purchased.
3. Various technical details of the project
4. Time needed for execution of the project. Assumptions made in calculating the time. For e.g. that particular components of the project would be completed in the desired stipulated time.
5. Onsite personnel requirements

4.2.4 Subcontracting

- In some turnkey projects, it does happen that the vendor does not have expertise in some particular domain/component of the project.
- In such cases, generally **third party consultants** are hired to enable the ESO vendors to handle that specific component.
- **Sub-contracting** is generally not done, as it is generally not allowed in the contract. One of the reasons for this is the requirement to share information with the sub-contractor.

- However, some clients outsource some services to one ESO vendor and the rest to other. For e.g.: designing of a chip may be outsourced to one ESO vendor and testing to other. Improved product performance and ensuring right quality are the reasons for doing this.

4.2.5 Pricing mechanism of IT engineering services

There are two options of pricing outsourcing projects:

1. Time and material pricing
2. Fixed pricing for the entire project

- **Time and material pricing:**
  - Here the time component is on the basis of hourly/weekly/monthly cost per engineer+ other overheads such as manager's fees.
  - Material component includes the cost incurred in obtaining the materials required for the project. However, on some occasions the materials required can be provided by the client himself.
  - Time and material pricing is generally preferred due to the high level of uncertainty involved in the projects.
- **Fixed price for the entire project:**
  - This option is less preferred as risks associated with the project in this mechanism increase which can increase the cost of the project.
  - However, some new customers do demand such kind of pricing, majorly in case of turnkey projects.

4.2.6 Tools used for promotion by IT ESO companies

- Conferences/seminars
- Participation in trade fairs held in U.S., Europe, Singapore, China etc
- Publishing technical articles in journals
- Direct marketing
- Internet marketing by sending technical journals and articles to the target clients via e-mail.

4.2.7 Selection criterion of professionals for onshore/offshore projects

- Generally ESO vendor selects engineers for a particular project. The criterion for selection is the expertise and experience in handling similar projects before.
- The engineers can be changed while the execution of the project.
- In case of onshore projects, resumes of the engineers suitable for the project are sent to the client who late communicates with the engineers via telephone and then the selection of the engineers is done.
- The engineers are made to sign a non-disclosure agreement (NDA) which prevents them from sharing the information obtained for the project outside.
- For some complex projects short training is also required to be given to the engineers.

4.2.8 Process control for outsourcing projects

- Processes to be used for the project are generally discussed and mutually agreed upon with the client.
- Generally processes used should be ISO 9000 certified.
- There are process specialists who make sure that the necessary compliances of the processes are met.

4.2.9 Error/bug control system

- Bug tracking systems are available for handling bug in the technical processes and even for project scheduling.
- Systems can be either with the client or the ESO vendors.
- After completion of the project the system is invariably shifted to client. If problems are faced by the client then he may mail his queries and pay the ESO vendor to fix them.

4.2.10 Penalty in case of failure/ warranty provided

- Generally penalties are not charged to the ESO for failures/delays in project because most of the projects are collaborative in nature.
- Also if the penalties are introduced in the contract they would increase the price due to the increase in the risk involved.
- In case of projects priced on fixed cost basis, sometimes penalties are a part of the contract.

- Also, new customers do insist on having a provision of penalty in the contract.

4.2.11 IPR sharing:

- Intellectual property of the project is generally retained by the client on the completion of the project.
- However in case of the projects involving the partnership with the tool manufacturer/product vendor company IP is shared between client and the ESO vendor.

4.2.12 Provisions for termination of the contract

- Generally there is a provision for terminating the outsourcing projects with the minimum stipulated months of notice as per the contract.
- In some cases, due to funding problems sometimes the projects are either cancelled or postponed.

4.3 Descriptive Research

- On the basis of the insights collected from the exploratory research, descriptive research was carried out.
- Following are the major motives of carrying out the descriptive research
    1. Finding the markets from which Indian IT ESO vendors get maximum clientele and markets which offer maximum competition to Indian IT ESO vendors.
    2. Understanding the importance of various factors in selecting the engineering service to outsource.
    3. Understanding the strengths of Indian IT Engineering services outsourcing industry
    4. Understanding the contribution of various channels(direct marketing, tender sales, e mail inquiries etc in getting IT engineering services project)
    5. Understanding the effectiveness of various tools of promotion

- The survey is done by conducting survey with senior engineers/project leaders of various IT engineering services outsourcing companies in Ahmedabad.

- The structured questionnaire used for the survey is attached in the following pages:

Questionnaire (IT services outsourcing)

Part 1 (Company Specific)

1. Which are the major verticals that your companies serve?

   _____

   _____

2. Which services offered by your company are in maximum demand for outsourcing?

   _____

   _____

3. Does it happen that a part of the project is subcontracted?
   (a) Yes ____
   (b) No ____

4. Rank the following channels for getting projects in the decreasing order, Such that the Rank#1 is given to the channel generating which contributes maximum in getting projects and Rank#5 to the one which contributes minimum.

   Direct Marketing ( )

   E-mail inquiries ( )

Tender sales/RFB ( )

Partnership with tool/product vendor company ( )

Any other, please specify _____

5. Which pricing mechanisms are used in pricing the projects?

Fixed price for the entire project ( )

Time and material pricing/variable pricing ( )

Any other. Please specify _____

6. Rank the following tools of promotion in the decreasing order of their effectiveness.

Direct Marketing ( )

Trade fairs ( )

Conferences /Seminars ( )

Publishing technical articles in journals ( )

Internet Marketing ( )

7. Which are the main countries from which maximum clientele are obtained?

_____

Part 2 (Industry/Sector Specific)

1. Please mark the following factors on a scale of 5, considered in deciding the services to outsource. Here, 5=extremely important and 1=least important.

	1	2	3	4	5
i. Importance of the service in the performance of the final product	____	____	____	____	____

ii. Cost savings possible if the activities ____ ____ ____ ____ ____
are outsourced.

iii. Amount of interaction and judgment required ____ ____ ____ ____ ____
on the part of the client to handle that service

iv. Availability of standards/benchmarks available ____ ____ ____ ____ ____
to perform and judge the services.

v. Risks involved in sharing the information/ ____ ____ ____ ____ ____
Intellectual property

vi. Risk involved in case of failure of the service ____ ____ ____ ____ ____
Provider

2. Listed below are few factors which are considered in selection of Engineering Services provider. Please mark these factors on a scale of 5. Here, 5=extremely important and 1=least important.

	1	2	3	4	5
Similar projects handled before	____	____	____	____	____
Reputation of the Engineering Services provider	____	____	____	____	____
Price quoted for the project	____	____	____	____	____
Projected time quoted for the project	____	____	____	____	____

Recommendation of others from the industry ____ ____ ____ ____ ____

3. Listed below are some factors which make India a favorable place for outsourcing. Mark the factors on a scale of 5, considered in deciding the services to outsource. Here, 5=extremely important and 1=least important.

		1	2	3	4	5
I.	Cost saving possible by outsourcing the activities to India	____	____	____	____	____
II.	Proficiency of English language amongst Indian professionals	____	____	____	____	____
III.	Availability of highly skilled engineers in India	____	____	____	____	____
IV.	Availability of good number of companies for engineering services outsourcing	____	____	____	____	____

4. Which countries are the major competitors of India in Engineering Services Outsourcing?

4.3.1 Sample frame:

IT engineering services companies in Ahmedabad and Gandhinagar formed the sample frame for the survey.

4.3.2 Sampling method:

- Convenient sampling method was used for the selection of the sample units.
- IT engineering services companies in Ahmedabad and Gandhinagar were contacted and the companies which responded favorably were surveyed.

4.3.3 Sampling unit:

For the purpose of the survey **IT engineering services** companies based in **Ahmedabad** and **Gandhinagar** were surveyed. Majorly **team leaders** of **outsourcing project teams** were the respondents for the survey.

4.3.4 Sample size:

A total of 11 respondents from 8 companies were a part of the survey

4.3.5 Companies surveyed:

Sr No	Name of the company	Location	Major Services offered
1	Patni computers	Gandhinagar	Product Engineering services, Infrastructure management
2	E Infochip	Ahmedabad	ASIC design and verification, product development
3	Si bridge	Ahmedabad	ASIC design and verification, product development
4	Tech Teer system	Ahmedabad	Software development
5	Silvertouch pvt ltd	Gandhinagar	Software development
6	Gateway technologies	Ahmedabad	Product development, application development and testing
7	Icenet technology	Ahmedabad	Remote Infrastructure
8	Tatvasoft	Ahmedabad	SEO,web development

PART 5: RESEARCH FINDINGS

The response to few of the questions asked in the survey is as follows:

1. **Which services offered by your company in maximum demand?**

Response:

The services which are in maximum demand for off shoring are as follows:

- IC Design and verification
- FPGA
- Development and maintenance of software
- Embedded system
- Product development
- Remote infrastructure
- Infrastructure Management

2. **Rank the following channels for getting projects in the decreasing order.**

Response:

1. Partnership with tool/vendor Company
2. Referrals from existing/past clients
3. Direct Marketing
4. E mail inquiries
5. Tender sales/RFB

3. Rank the following tools of promotion in the decreasing order of their effectiveness.

Response:

1. Direct Marketing
2. Conferences/Seminar
3. Internet Marketing
4. Publishing technical articles in journals
5. Trade fairs

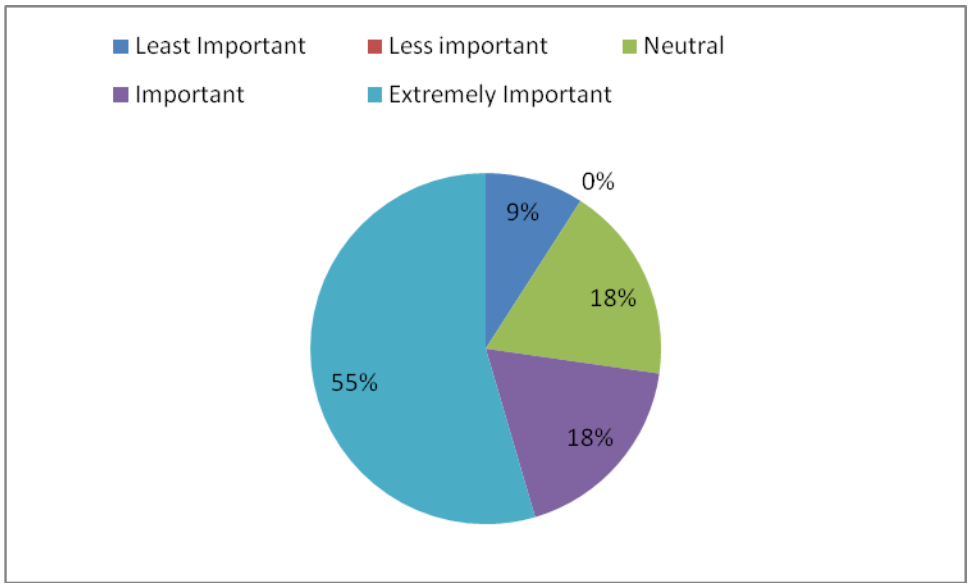
4. Which are the main countries from which maximum clientele are obtained?

Response:

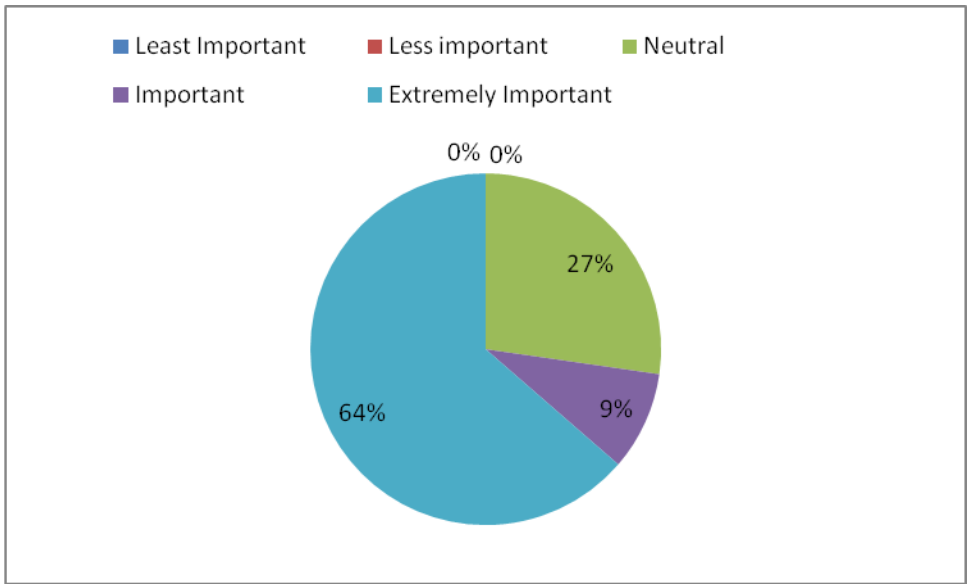
U.S, UK, Germany, France, Canada, Australia

6. Please mark the following factors on a scale of 5, considered in deciding the services to outsource. Here, 5=extremely important and 1=least important.

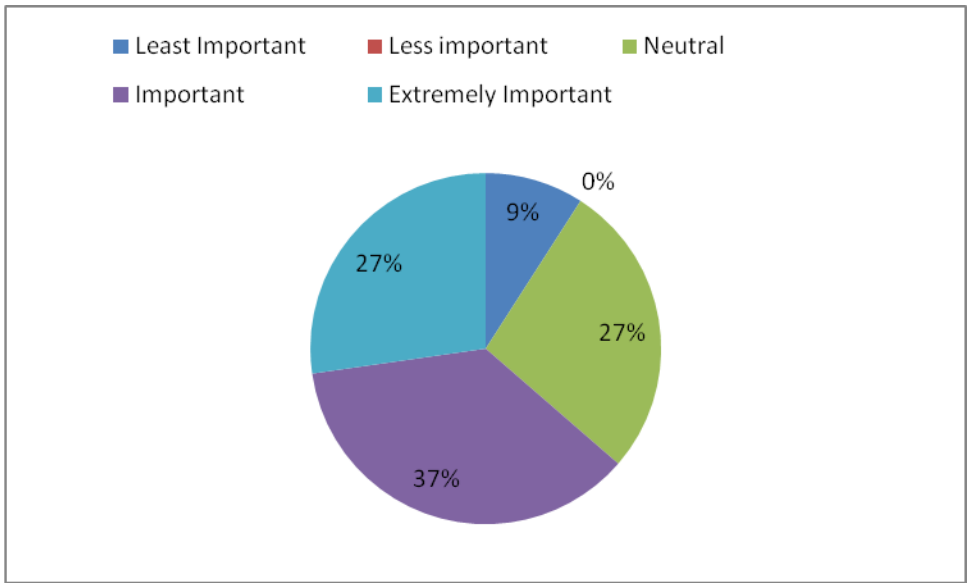
I. Importance of the service in the performance of the final product



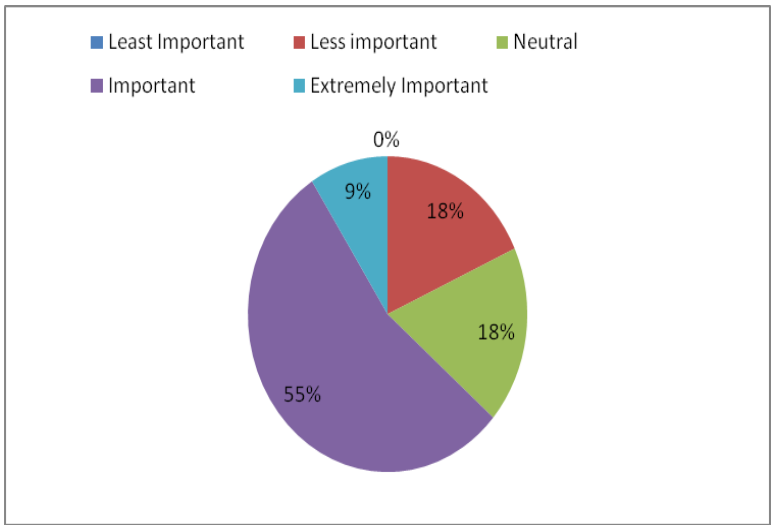
II. Cost savings possible if the activities are outsourced.



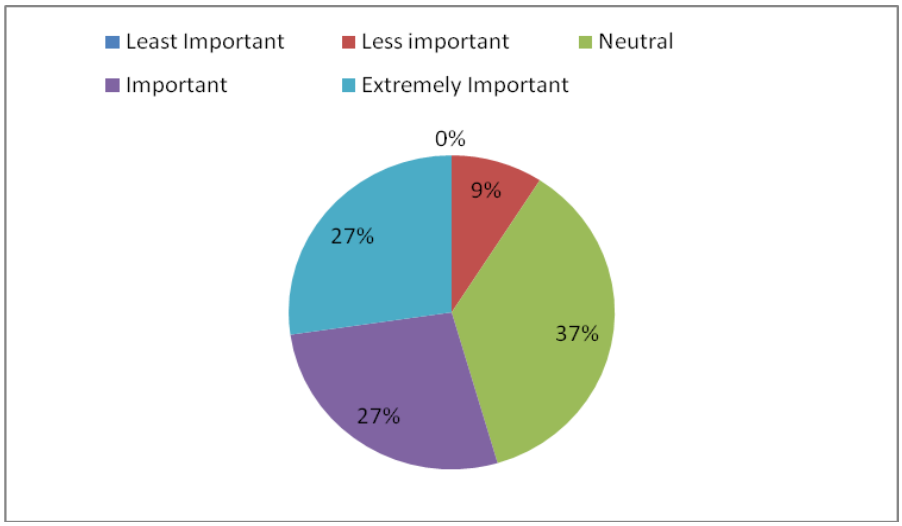
III. Amount of interaction and judgment required on the part of the client to handle that service



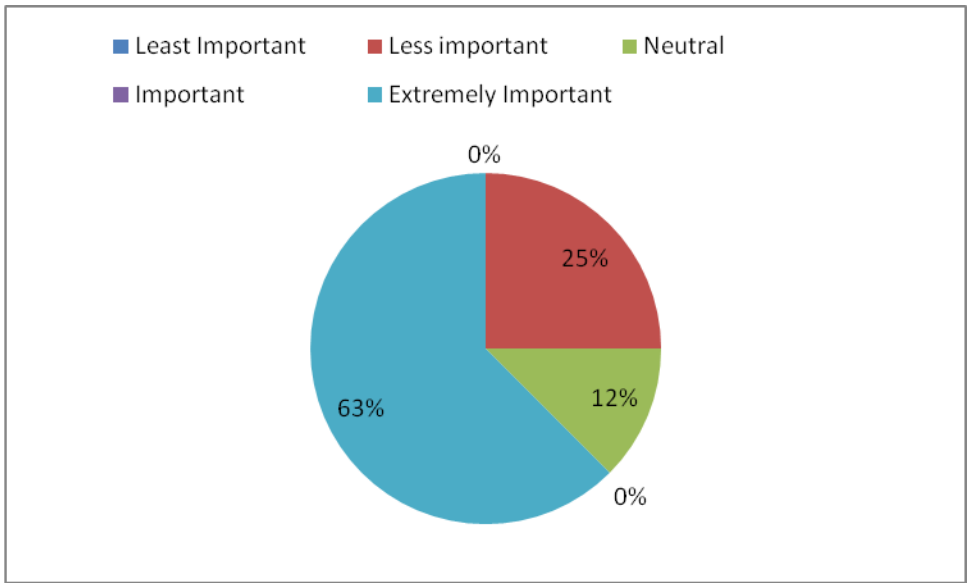
IV. Availability of standards/ benchmarks available to perform and judge the services.



V. Risks involved in sharing the information/intellectual property

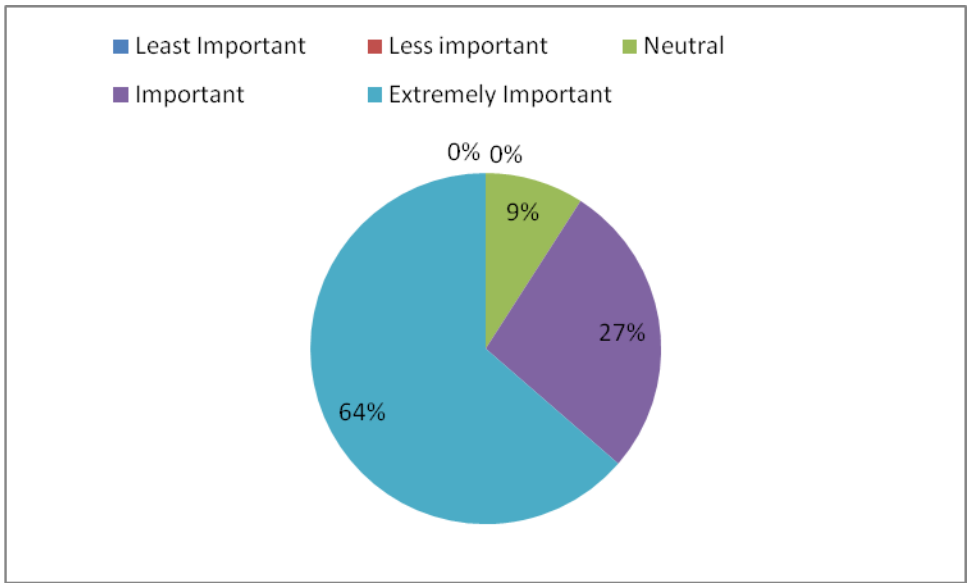


VI. Risk involved in case of failure of the service Provider

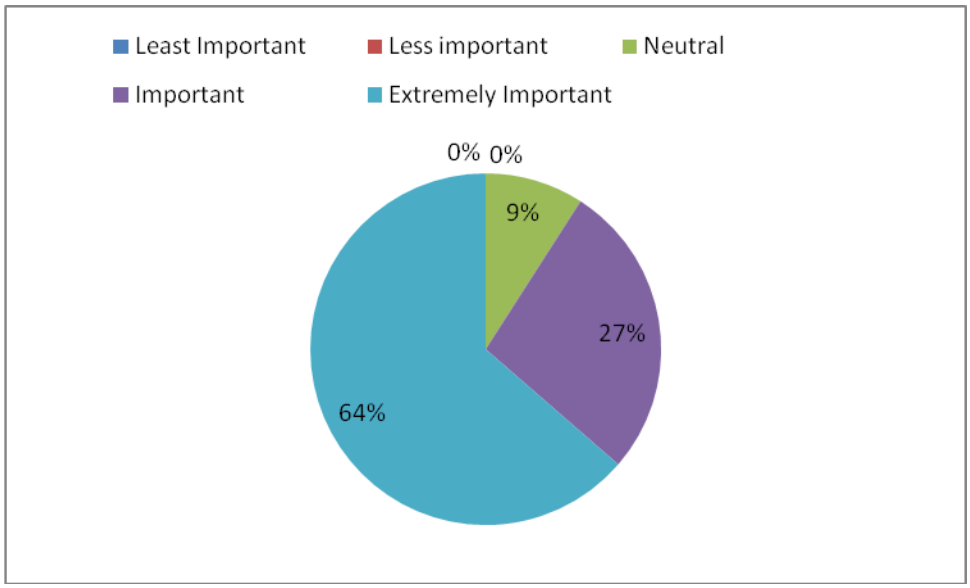


5. Please mark the following factors considered in selection of Engineering Services provider. Please mark these factors on a scale of 5. Here, 5=extremely important and 1=least important.

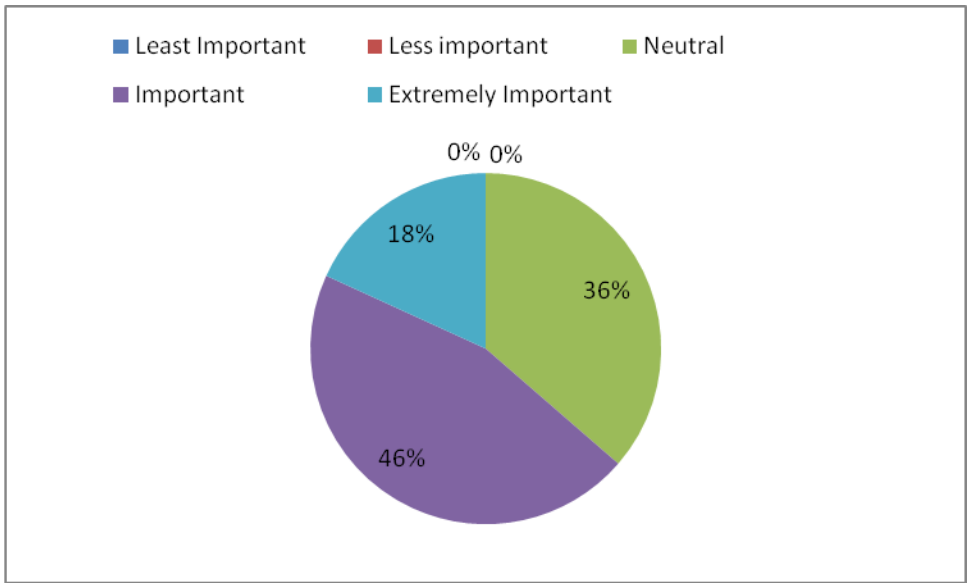
I. Similar projects handled before



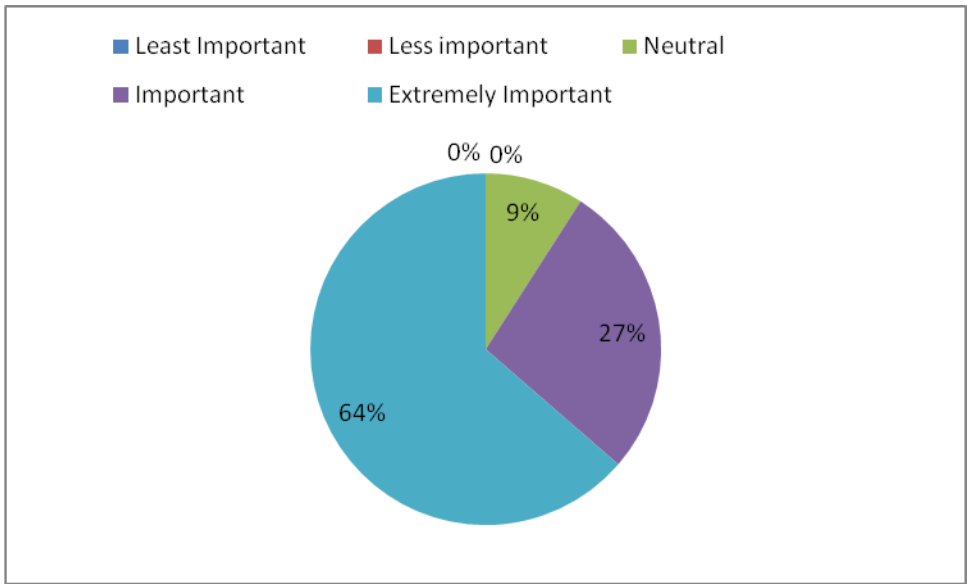
II. Reputation of the Engineering Services provider



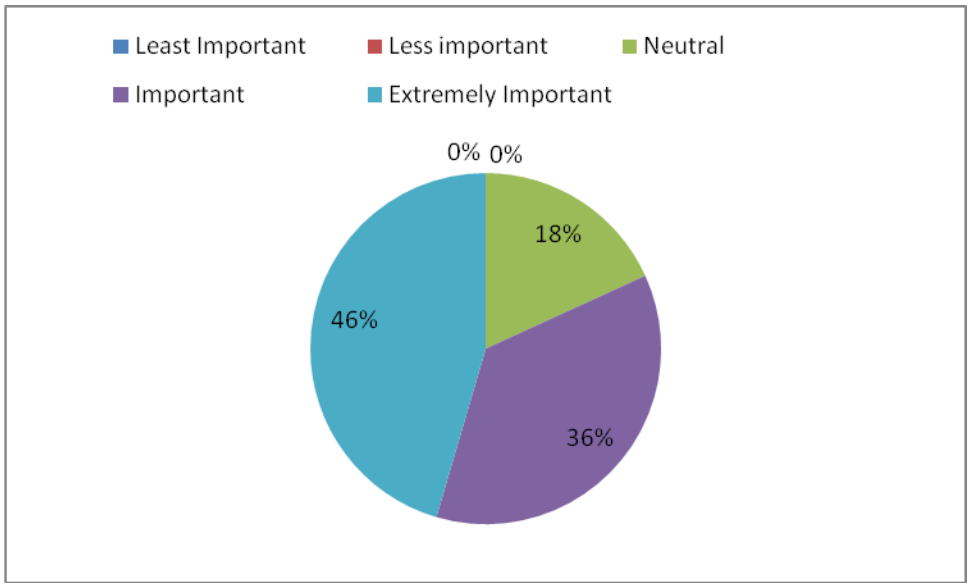
III. Price quoted for the project



IV. Projected time quoted for the project

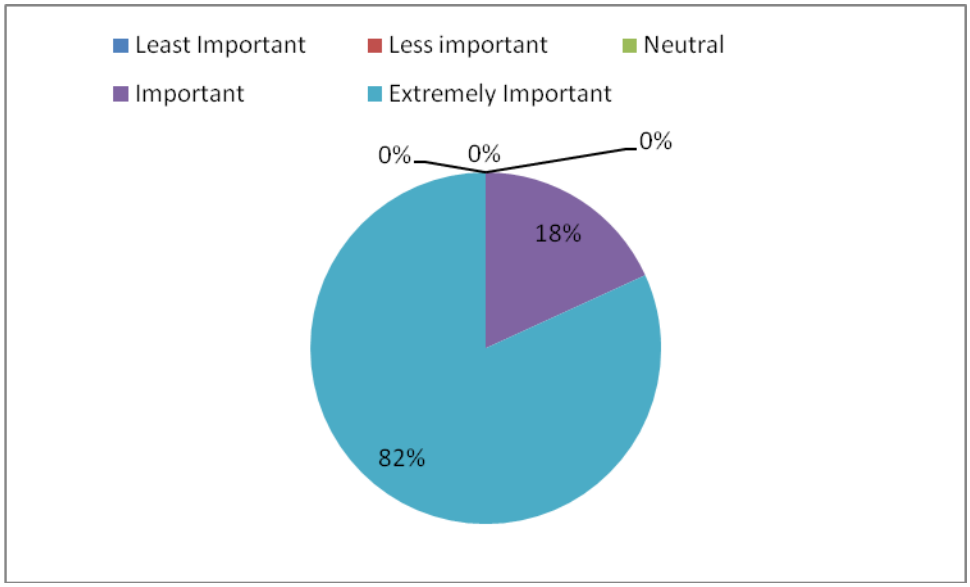


V. Recommendation of others from the industry

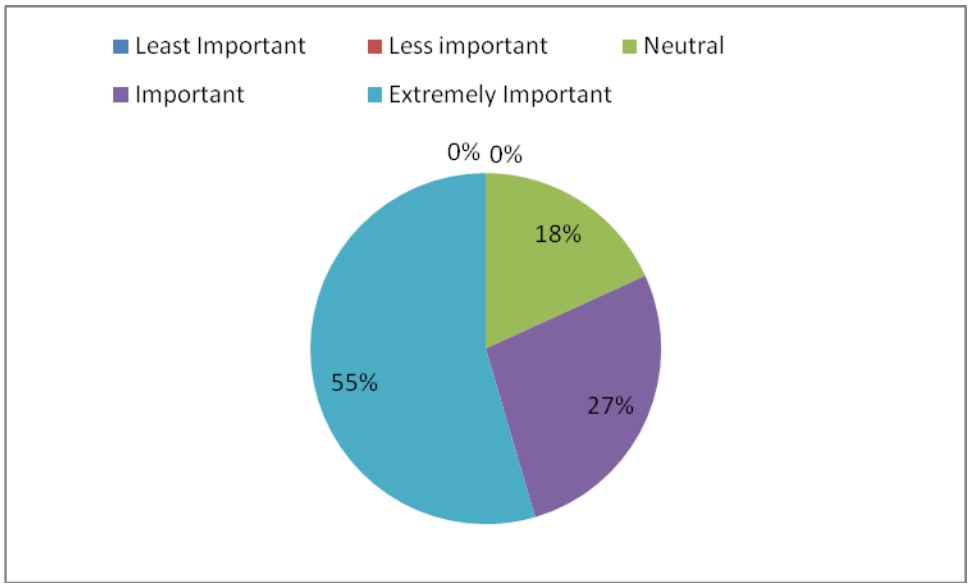


6. Rank the factors which make India a favorable place for outsourcing on a scale of 5.

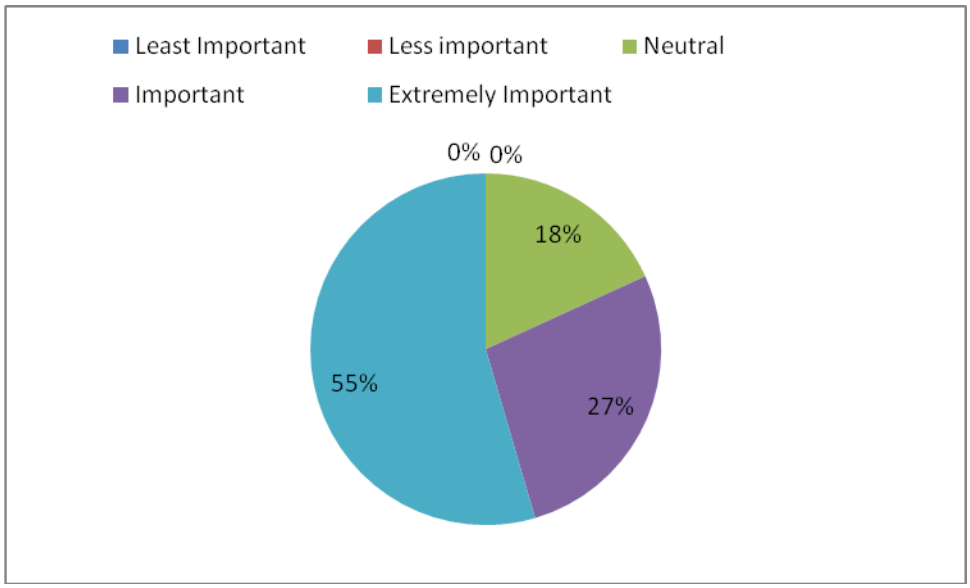
I. Cost saving possible by outsourcing the activities to India



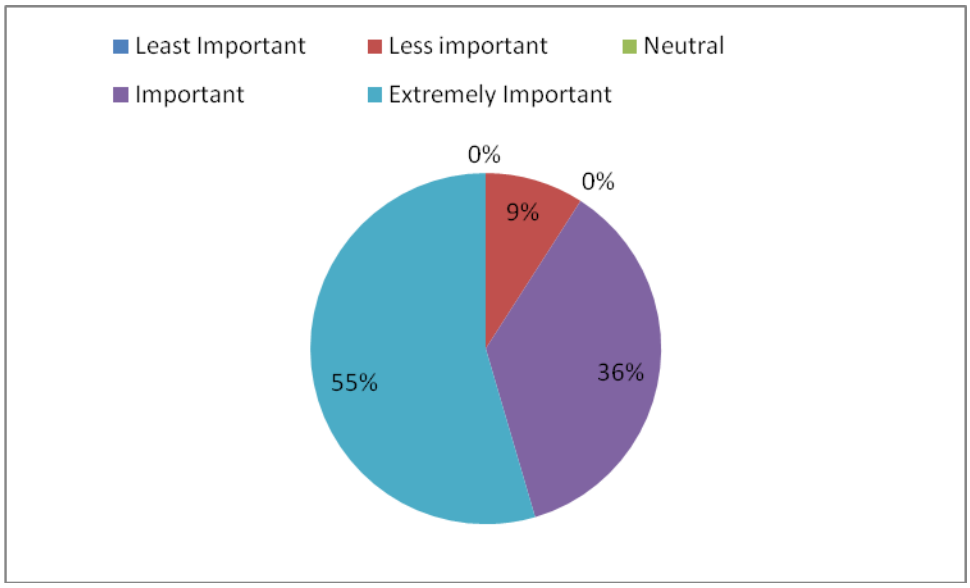
II. Proficiency of English language amongst Indian professionals



III. Availability of highly skilled engineers in India



IV. Availability of good number of companies for engineering services outsourcing



7. **Which countries are the major competitors of India in Engineering Services Outsourcing?**

Russia, China, Korea, Japan, Brazil, Mexico, Netherland, Vietnam, Romania, Spain, Phillipines, Indonesia, Singapore, Hong Kong

Part 6: CONCLUSION

6.1 Critical success factors for Indian Engineering Services Outsourcing Industry

The major factors for the success of Indian Engineering services outsourcing industry are as follows:

- Cost saving possible by outsourcing the activities to India
- Proficiency of English language amongst Indian professionals
- Availability of highly skilled engineers in India
- Availability of good number of companies for engineering services outsourcing

Thus, considering the expected Rs100,000Cr market for Engineering Services Outsourcing there is a big opportunity for the growth of ESO vendors. Also there is a need for establishing more number of quality of technical institutes for the industry to thrive.

The services which are in maximum demand in India are Chip design and verification, FPGA, software development, Embedded system, Remote infrastrucutre management.

The countries which form the major clintele for Indian ESO vendors are U.S, UK, Germany, France, Canada, and Australia due to the huge amount of R & D taking place in these countries.

The countries which are the major competitors of India in the Engineering Services Outsourcing market are Asian countries such as Russia, China due to the huge workforce availabe in these countries. However the competive advantage of India vis-à-vis these countries is the knowledge of English language amongst the engineers.

Some other south east Asian countries such as Korea, Japan due to the technological advancement in these countries and Indonesia, Singapore, Hong Kong due to the cheap labor availability also provide good competition to India in the ESO market. Some American countries like Mexico & Brazil and Europoean countries like Netherland, Vietnam, Romania, Spain, Phillipines are also emerging in the ESO market.

6.2 Consideration in deciding the services to outsource

The most important considerations in deciding the services to outsource are as follows:

- **Importance of the service in the performance of the final product:**

  This is generally the most important factor for outsourcing as generally companies retain the critical components of the projects and outsource the peripheral tasks to the ESO vendors.

- **Cost savings possible if the activities are outsourced:**

  This factor also plays a key role in the decisions related to services outsourcing as this help in reducing the expenses for the entire project.

- **Risks involved in sharing the information/intellectual property:**

  Retaining the intellectual properties is one of the most critical issues in the outsourcing projects. Normally engineers are made to sign Non Disclosure Agreements (NDAs) to counter these problems.

Some of the other important factors considered are as follows:

- **Amount of interaction and judgment required on the part of the ESO vendor to handle that service:**

  The services which require high amount of judgment on the part of the ESO vendors are generally not outsourced

- **Availability of standards/ benchmarks available to perform and judge the services.**

  Generally those services which are easy to evaluate on standards and benchmarks are considered for outsourcing.

6.3 Critical success factors for the ESO vendors

The factors which are most important in the selection of an ESO vendor for the outsourcing projects are:

- Similar projects handled before
- Reputation of the Engineering Services provider
- Projected time quoted for the project
- Recommendation of others from the industry

Price quoted for the project although an important factor, but is not as important as the above factors as if the ESO vendors are successful in providing right quality of work within the time frame, the clients tend to continue with the same ESO vendors and thus a loyal customer base can be formed.

The most effective channels for getting project in the decreasing order are as follows:

1. **Partnership with tool/vendor Company:** It is the most effective tool as long lasting relationship is established with the client and it becomes easy for the ESO to function as per the client's requirement. If the service provided is high on quality and within the time frame, the clients generally do not switch.

2. **Referrals from existing/past clients:** This is similar to word of mouth publicity where the existing clients refer the ESO vendor to the potential clients with similar requirements. Important thing to note is that if the clients are not satisfied with the service, then it may result in negative word of mouth as well.

3. **Direct Marketing:** ESO vendors generally have their sales team in the countries which have maximum potentials for getting projects. This helps them in adding new clients.

4. **E mail inquiries:** ESO vendors also get inquiries through internet. Web marketing plays an important role in this industry. It is due to this reason that ESO vendors add a lot of case studies on their websites which proves their competencies in various domains. Also technical articles are sent to the potential clients via e-mail.

5. **Tender sales/RFB:** This is the least effective tool for getting projects.

The most effective channels for promotion/communication in the decreasing order as per the research are as follows:

1. Direct Marketing
2. Conferences/Seminar
3. Internet Marketing
4. Publishing technical articles in journals
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