



# Cost Estimation Tool Development for Industrial Site Service Activi- ties by Application of Service De- sign Methods

Muhammad Yasir

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**Cost Estimation Tool Development for  
Industrial Site Service Activities by  
Application of Service Design Methods**

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Muhammad Yasir Muhammad Yasir

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Main objective of thesis is to develop a novel cost estimation model for industrial site service activities. This financial model is devised for a particular global industrial firm specialized in delivering electrical and automation solutions for marine business. General principles of the new cost estimation model can be also utilized for other industrial service organizations. Overall development of cost estimation tool is based on double diamond service design process which considers main aspects of user experience. Cost calculation tool is devised keeping in view the firm's product portfolio and requirement of marine projects. This tool will be utilized by firm's sales support engineers in estimating site costs of new building projects.

This thesis starts with introduction of shipping industry in general. It highlights the incredible growth in this sector owing to mainstream tourist activity which is boosting cruise industry and ever-increasing demand of cargo worldwide. In the beginning, overview of cost estimation methods for service business is given with aim to familiarize readers about challenges and key concepts. This acts as a guide and naturally helps readers in better understanding of the study.

Theoretical background of this thesis is built on various pricing methods and concepts that can be applied to service industry. It gives a solid foundation about pricing strategies and key principles about each method. This is followed by description of service design process, benefits of co-creation and discussion how service design process is utilized in this thesis for estimating the service pricing for the case study. Afterwards, there is discussion related to motivation for choosing double diamond process and details of how different service design tools help in our research process.

Empirical findings are based on detailed statistical analysis, depicting the dire need of new cost based financial model. Qualitative research pointed out the limitations of existing financial tool used in the firm and sheds light on the reasons behind its inability to rectify the errors embedded in existing cost estimation tool. New cost calculation tool is developed based on double diamond process and associated service design tools with emphasis on user needs and intended purpose.

Developed cost estimation tool was prototyped in Microsoft Excel and after rounds of feedback, it was tailored to address gaps present in the old monetizing model. Modular structure of new tool offers robustness and flexibility. It can be easily customized to future needs of the organization. Proposed cost estimation method presented in this thesis can be easily implemented in related service firms for estimating service and site cost estimation. This study showed a general approach how service design process and tools can be applied in developing financial schemes for service-based firms operating in diverse environments.

Keywords: pricing methods, service design process, service organization, double diamond process, marine industry, cost estimation methods.

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## 1 Introduction

Marine or Shipping Industry is considered one of the most important industry and constitutes the backbone of trade infrastructure. It plays a vital role in the economy and growth of a country. Although there has been quite impressive advancement in the transportation sector by land and air, but still sea transportation is still very prime, also economical and tops the list in the mode of transportation. With the world turning into a global village, there has been a huge push in marine sector for bigger, faster and more economical ships.

According to Freight Hub (2018), sea trade contributes to about 90% of the trade done world-wide. Although transit time for seaborne trade takes much more time than other transportation methods but still it has much more advantages, especially when it comes to large volumes and economics.

Previously ships have been primarily used as mode of transportation for moving cargo and passenger from point A to B. But there has been a paradigm shift in the recent years which has given birth to new markets in marine industry falling under the category of leisure, especially cruise industry. More and more luxury mega ships are being manufactured across the ship yards worldwide. The recent trend shows a positive inclination in cruise industry along with other vessels segments in the shipping sector. There are increasing number of new market players that are joining cruise business. This has increased number of new vessels that are being built worldwide.

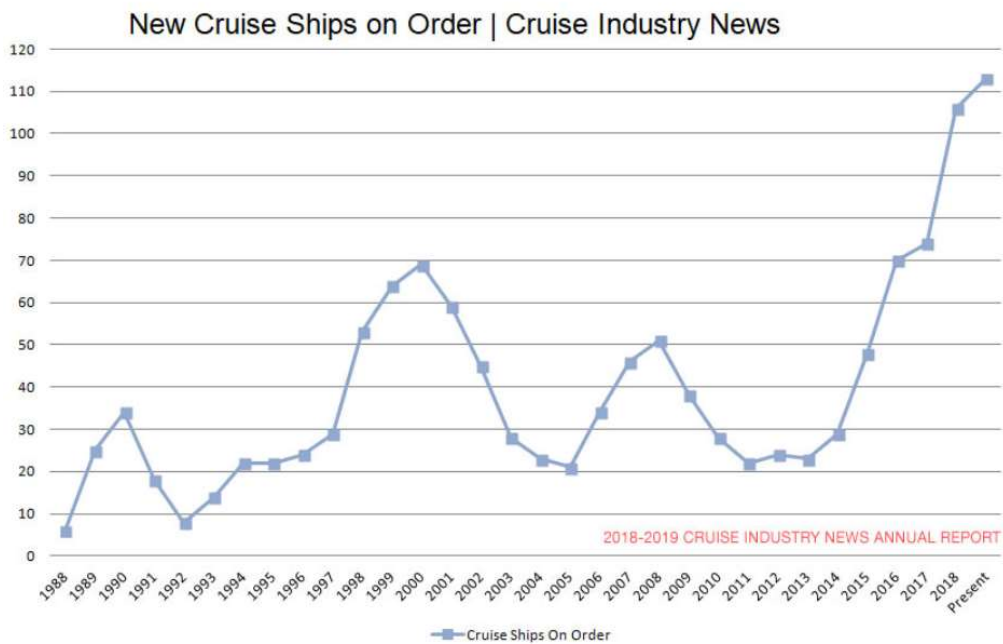


Figure 1 Annual Report Cruise Industry 2018-2019

## 1.1 Background

It was discussed in the previous section that despite tremendous advancement of mobility sources in air and land, marine industry still is on the top in transportation business. It was highlighted that there has been incredible growth in leisure side of marine business especially in the cruise industry. As tourist industry is flourishing, more and more people tend to travel around the globe by air and sea. Although air travelling is still one of the fastest and reliable ways of travelling but travelling by sea is also considered quite safe and secure.

With increase in sea trade volumes and in number of travellers for leisure purpose, companies have been investing in marine market. In order to be competitive economically and also to have technical distinguishing features, there has been great developments in ship building industry. With the vision to make bigger and better ships, companies have been digitalizing and improving ship building technologies that can yield the goal of more economic and faster production of ships.

In order to keep up with the market demand, ship building industry is going through major revolution. This has put a lot of pressure for companies associated in the ship making business, to grow and adopt to new technologies that can boost the production and also to decrease the time in making new ships. The expansion of business may bring challenges, complexity in organization hierarchy and functionality of company. The difficulties may arise from incapability to adapt to fast changing environment that is brought by market expansion, increased revenues, amplified human resources and expansion of operations.

Normally in ship industry, budgeting and contracting is done years before ship delivery. It is very vital that entities involved in ship making businesses have well-functioning internal processes and cost estimation tools that can help in predicting actual cost and expenses before contract signing. Detailed analysis, thorough knowledge, good financial and technical knowledge is a key to correct budgeting of project. Ultimate success of any company depends on financial success of the venture. Although it is quite hard to estimate all financial variables, especially when it involves materials that relate to volatile fluctuations but realistic assumption about income and expenses can help in setting the right goal.

Accurate project estimation is a key to rightly setup project's parameters, helps in keeping up with the milestones and overcome project's constraints and limitations. Therefore, it is of utmost importance that cost estimation or budgeting tools are up to date and takes into account all realistic constraints, challenges and gives out financial figure that helps in predicting accurate finances for the project which does not overshoots neither falls below realistic financial figures.

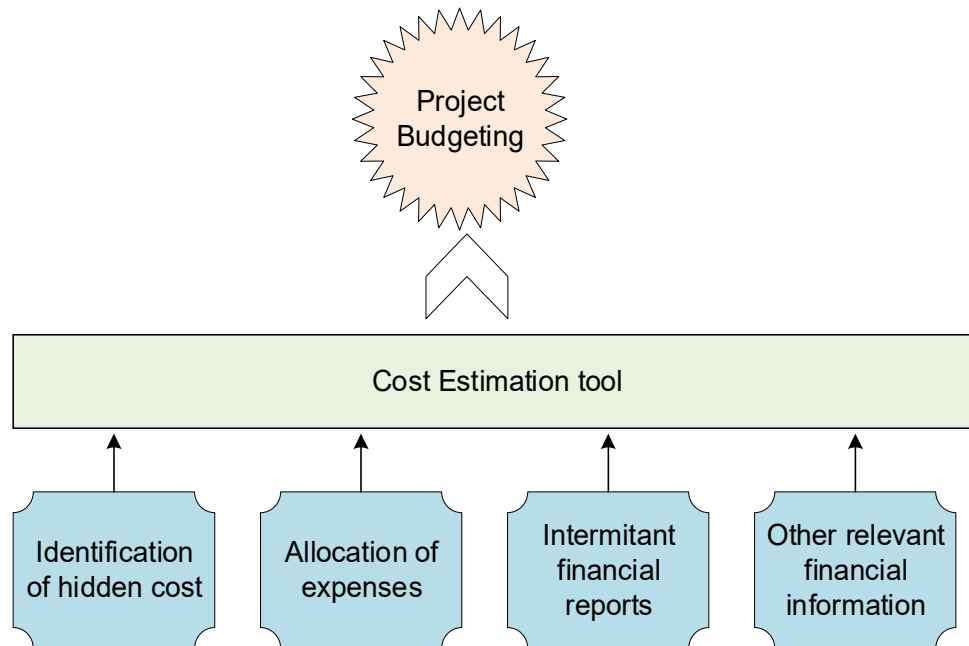


Figure 2 General project budgeting

## 1.2 Motivation

The previous section discussed challenges that are faced during project budgeting and role of cost estimation tools in defining the right market price for a certain project. The biggest challenge is to predict the actual costs years before the delivery of the project.

The main motivation of this thesis is to use service design tool for shaping cost estimation tools that organization can use flawlessly in development of project proposals. Main target industry is marine and ship building. Service design is best known for its innovative approach towards problem solving by collaboration and interaction of all relevant stake holders, by introducing processes and methodologies that focus on eradicating bottle neck of problem and looking at challenges from an entirely different perspective (Shostack 1982; Bitner, Ostrom and Morgan 2008; Viio and Grönroos 2014).

It has been a bit difficult task to find research work that utilizes service design methods in area of financial models or cost estimation tools for project-based companies. Therefore, service design methods and processes were applied from a new perspective. The author of this thesis has been working in marine industry for past 8 years in different roles and activities, so main idea is to utilize his experience and expertise blended with knowledge of service design methods and processes, to devise a cost estimation tool that can help in making accurate financial project proposal for a given marine project.



One of the motivational goals of this thesis is to learn the practical application of service design methods, their applicability in the real-world cases and challenges occurring in large organizations consisting of vast organizational structure, broad portfolio of products, services, complex cross-functional communication and collaboration with diversified customers.

### 1.3 Research Goal

Key goal of this research is to develop a financial tool based on cost estimation for industrial site service activities cost, devised for global industrial firm delivering electrical and automation solutions for marine business. Thesis is targeting one of the biggest companies known for its broad range of products and services in the field of marine business.

Like any other project related companies, marine ventures involve several market players supplying specific scope of supply. Only those companies are successful in project businesses that forecast their real cost, map their assets with project plan and deliver as per intended plan.

The financial proposal for marine project depends on number of variables and takes into account cumulative sum of site activities cost, equipment costs, site management, project management and general administration plus some running expenses for the company etc.

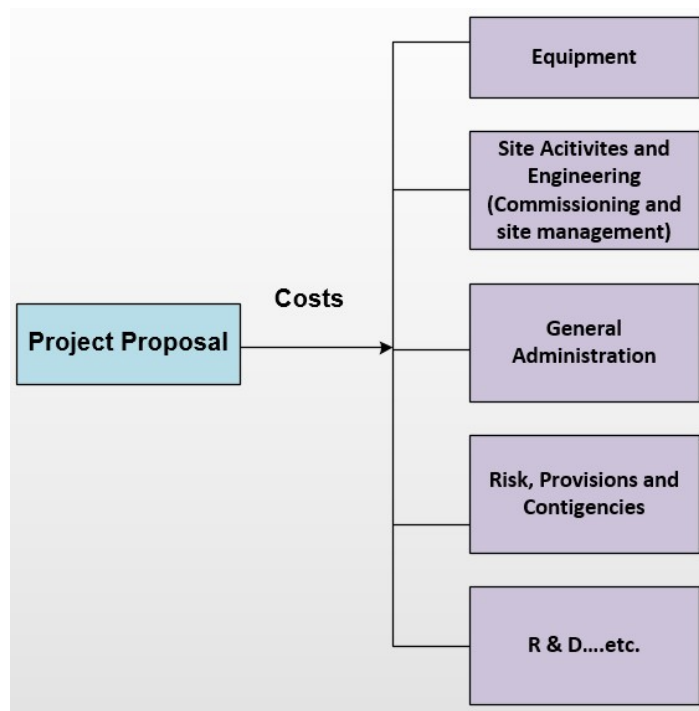


Figure 3 Factors considered in project proposal estimation

Keeping in view limitation of resources and time tenure, only one of the main blocks from previously explained project budgeting factors was selected, namely site activities cost. The reason of selecting this parameter was based on its volatile nature and challenges it poses for accurate cost estimation for certain projects.

Main focus of research is to devise a calculation method for estimating the cost of site activities by minimizing the error arising from the influential factors and to utilize easy and simple processing of data collection. It should improve user experience, provide quick and accurate estimation for different projects having variable scope of supply.

As a summary, goal is to address two main questions:

1. How to devise a cost-based financial model for site activities that take into account complexity and diverse nature of marine projects?
2. How does the financial model for site activities improve user experience and predict accurate cost estimations for its intended user?

The ideal objective is to create a cost-based tool that is simple to utilize and considers all the critical elements causing financial deviations. The pricing model should be based on modular structure which makes the modelling flexible and adaptable to future customizations.

#### 1.4 Research Approach

Initial work will consist of studying available cost estimation tools used within the organization and follow ongoing practices used in making estimation for site activities for projects. After that we will focus on finding limitations of current tool and associated reasons for that. This will help in targeting and figuring out intended characteristics in new tool and avoiding shortcomings from previous version of cost calculation tool.

We will utilize double diamond process model and relevant service design tools to highlight shortcomings, findings and new insights about new/alternate cost estimation model. After completion of this task, findings from service design process are prototyped and finally tested to verify authenticity of the new cost calculation tool.

In addition to service design process, we will utilize concept of fish bone diagram, also known as cause and effect diagram. José Blesa & Blehm (2015) described it as a great visualization tool that helps to break down complex chain of processes and categorizes potential reasons or limiting factors causing discrepancy in expected results. This tool is well known for identification of root causes of problem and is a famous quality control tool.

## 1.5 Research Structure

The research is divided into two categories:

- **Theoretical knowledge:** It comprises of details about service design methods and process applied in the thesis.
- **Empirical development:** It is based on double diamond service design process utilizing both qualitative and quantitative data.

In first step, theoretical framework is collected about various pricing strategies used in financing industry. Key goal is to analyse price modelling techniques, how these are evolved and to study the applicability on our case study.

Second step consists of devising financial model for site activities based on the insights collected from relevant stake holders' interview. Contextual interviews are conducted in this regard from people having experience in this field and also from the supporting staff of project-based firm.

Insights collected from second step are combined with knowledge gained in first step to model new cost assessment model for site activities. After devising cost estimation tool, it will also be tested for its authenticity and to offer better usability experience for its users by offering improved user interface.

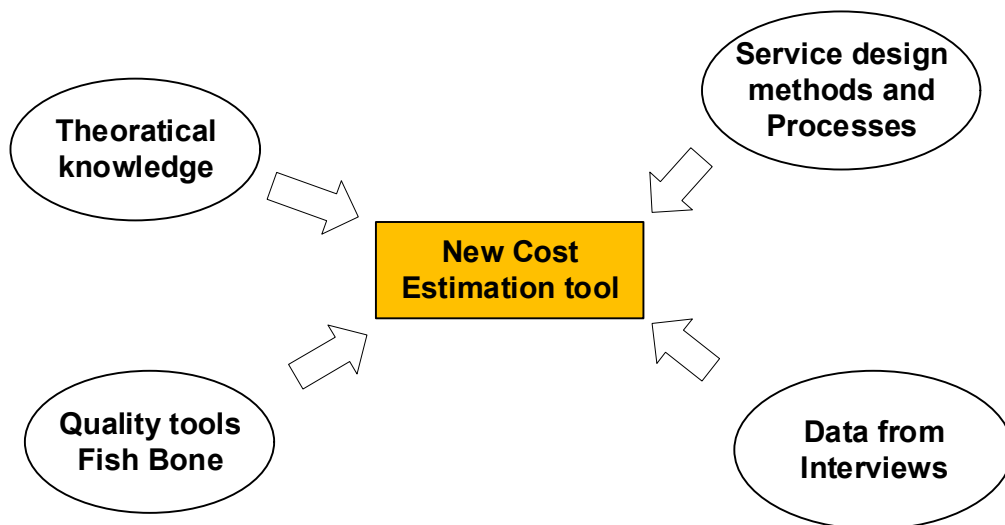


Figure 4 Structure of Research

## 2 Literature Review

Cost estimation of services has always been challenging. As service is an intangible product so there is no hard and fast rule for devising a pricing strategy for offered services. It is quite different from pricing methods used for tangible products, which can be easily scaled. Product pricing can be based on its cost of production, value in market, competition, transportation cost, gross margin and marketing costs. Same technique cannot be applied for pricing of services.

Service activities falls under category of service business. Its intangible nature makes it difficult to measure and quantify. Service is based on actual value perceived by end customer and service provider.

One important point is that services and its prices are built in relation to customer needs and demands. Viio and Grönroos (2014) points out the fact that for developing business relationships between buyer and seller, mostly latter one has to adapt to growing needs of the first one. This study focuses on same fact and gives quite intrinsic framework that can be used by commercial firms that can modify and change their sales process to fulfil/exceed the customer expectations.

Any company, irrespective of its pricing model, will not be able to make money if customers are not willing to pay for its service. One important point that should be highlighted here is that irrespective of the pricing strategy used, feedback from customers is very vital to check and interpret customer's anticipation towards acceptability of pricing and services. Customer feedback give us valuable information of user's perceived value.

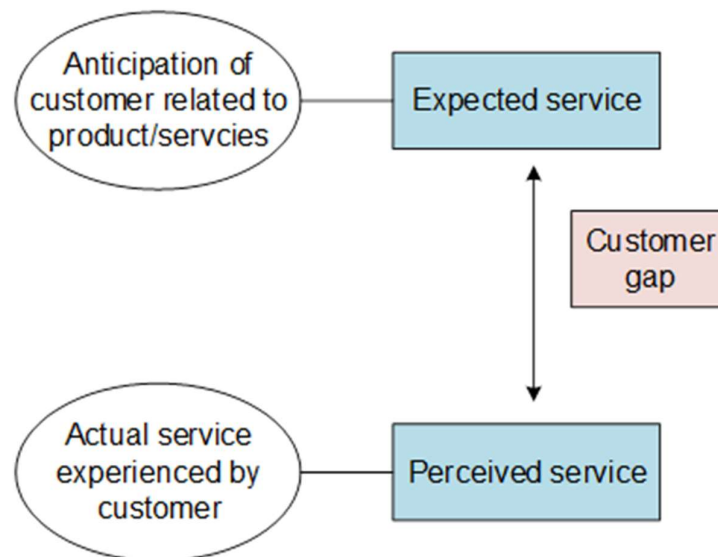


Figure 5 Customer Gap analysis

## 2.1 Service Pricing

Indeed, pricing is one of the most challenging tasks which companies faces while launching their products or services. Optimal cost estimation tools require extensive research, resources and time. In general, companies are not looking for high or low pricing but are more interested in price structure which gives the best return on investment (ROI).

According to Wirtz, Chew and Lovelock (2018), in development of pricing strategies, most significant factors to consider are cost of service or product, competition in market and customer-based characteristics. In addition to that, Hinterhuber (2004) states that there are three main key elements in making decision related to pricing, namely value perceived by the customer, competitive analysis and internal cost/profit examination.

Amanda (2017) discusses different methods used in pricing models used in service business and highlights challenges each model face in calculation of service pricing. She points out the fact that charging your customer for service is not in direct correlation to amount spent in performing those services.

There are many aspects contributing in service pricing and depends on various factors, for example support and documentation, after sales support, insurance, familiarity and user experience. All in all, value observed and evaluated by customer is a key to evaluate the service and its pricing. One simple evaluation tool is checking quality of the service. Lanze (2015) enlightens that consumer value is mostly inferred from quality. However, he also points out that it is not always correlated and sometimes quality can also exist independent of value inferred by consumer.

Amanda (2017) gives meaningful direction for service pricing by explaining pricing model for service business. The most conventional and simple approach is to calculate unit cost model like hourly rate for service pricing. It is described in following steps:

- I. Determining base cost

The most vital factor is finding out exact expense borne by the company for providing services for its customers. Hourly rate cost model is based on finding and understanding true cost experienced by company. Base cost can consist of multiple items as highlighted in following figure:

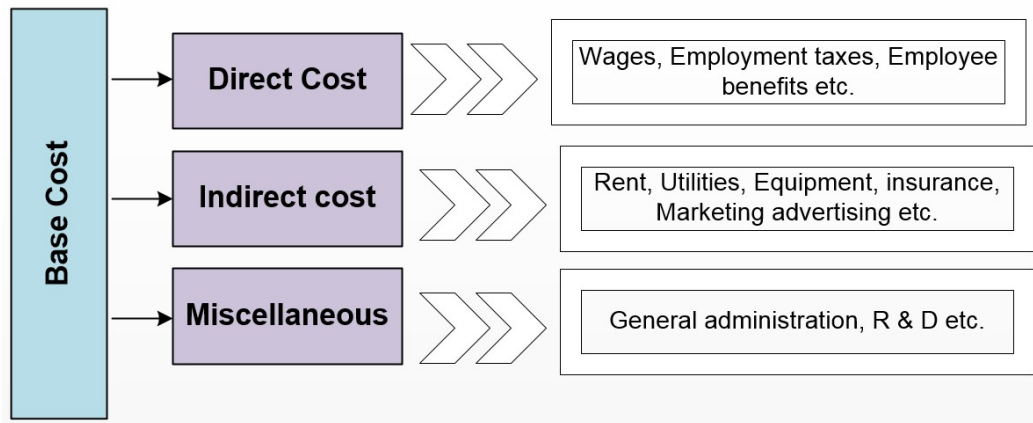


Figure 6 Formula for base cost

All these items, mentioned above, accumulate to make base cost that is incurred in performing services. Collection of data is simple and consumes time, but it is a one-time process. In case of big companies, there are hidden cost elements in form of selling, general and administrative expense that is shared between different business unit. Once the elements in base costs are defined then it is a matter of processing the calculation.

## II. Calculate unit cost (Hourly rate)

Hourly rate is very common pricing technique followed in service businesses. The benefit is evident from its simplicity. One needs to count number of hours spent on a certain development project and then multiply it with calculated hourly rate, it will give the cost right away.

As an exercise, if firm decides to hire a worker and plans its work for 37,5 hours per week, multiply 37,50 hours by 52 weeks. This calculation results in 1950 work hours for whole year.

But this is not a realistic figure as it includes also non-working time which includes national holidays, vacations, sick leave etc. that employee normally take off. Just for sake of simplicity we define it as if it will take 10% of non-working time.

Non-working time =  $1950 \times 0,10 = 195$  hours

Actual working hours per year = (yearly hours - non-working time)

=  $1950 - 195 = 1755$  hours

After having figure for actual working hours for whole year, now calculate billable hours by following formula:

Billable hours = (Actual working hours per year - nonbillable hours)

Non-billable hours account for tasks that do not generate revenue, like sourcing clients, general administration, facilitation services and filling out paperwork. This factor depends on hierarchy of company and nature of business in which company is dealing. Therefore, this factor can vary from company to company.

As an example, consider 25% of time is non-billable

Non-billable hours =  $1755 \times 0,25 = 351$  hours

So, billable hours become =  $1755 - 351 = 1404$  hours

From the step 1, base cost for business including all expenditure is then divided by billable hours to estimate hourly rate with profit. Considering base cost for whole year for particular employee is 70,000 €.

$$\begin{aligned} \text{Hourly rate (without profit) for employee} &= \frac{\text{Base cost for employee}}{\text{Billable hours}} \\ &= 70000/1404 = 49,85 \text{ €/hour} \end{aligned}$$

### III. Include profit margin

Normally service business operates between a profit margin of 10% to 30% but it depends on multiple factors ranging from market situation to individual decisions. A profit margin is also considered as a key to make cash reserve which shows value of company and also it helps in business growth if certain part of profit is invested back in business.

Finally, the hourly rate that can be utilized for estimating for pricing services of a business can be gives as follows

Commercial Hourly rate = Hourly rate without profit  $\times$  profit margin

From above example, considering a profit margin of 30% will yield following commercial hourly rate.

Commercial Hourly rate =  $49,85 \times 1,30 = 64,8$  €/hour

Finally, calculate number of hours spend on a certain project, simply multiply it with commercial hourly rate to evaluate price for that project.

## 2.2 Challenges in pricing Strategies for services

To make a profit, one needs to sell a product more than sum of all incurred cost. In product-based business, it is easy to get a reference point for original cost paid for the product. Knowing this reference, makes it easier to put a price tag by simply adding a margin. Service business is a special case where devising a price which would generate a target profit is not very easy and straight forward. Amanda (2017) highlights this fact by point out reason for it which is unavailability of reference for base cost. This calls out for the fact that service pricing should include all the intangible aspects of the business, for example time invested by company and value perceived by end customer.

Service pricing requires experience and theoretical expertise in formulating a link between a conceptual understanding of service pricing and complexity faced in real business cases. The easiest approach is to analyse available pricing strategies in similar service businesses and replicate pricing practices and strategies used. But this requires that pricing concepts and strategies should be understood at a more abstract level (Irene 2001).

Another challenge is also related to nature of business as well. Diverse nature of business can add complexity to pricing structure also. For example, business to business (B2B) and business to consumer (B2C) marketplaces have modernized the way to exchange goods and services, and firm needs to adapt and innovate for higher revenues. This brings in new challenges which firm faces in modelling prices which it should introduce in market before it becomes confused (Desiraju and Shugan 1999).

## 2.3 Pricing Strategies for services

As discussed earlier, pricing of services is not as straightforward as pricing for goods. Service pricing is complicated, and customers evaluate pricing of services differently than goods. Zeithaml, Bitner and Gremler (2016) has expressed three key differences between customer evaluation of pricing for services and goods. Then he explained common pricing structures for services and associated challenges. In later part of chapter, author defines customer perceptions of value and explain appropriate pricing strategies

There are many pricing concepts and there is no such thing as right or wrong pricing strategy. In this section, we will overview different pricing strategies to create a solid foundation that can act as a starting base for our cost estimation tool for site activities. We will concentrate on following pricing strategies:

### 1. Cost-based pricing



2. Competition-based pricing
3. Demand based-pricing
4. Price Differentiation

### 2.3.1 Cost-based pricing

This resembles with the conventional estimation method and is frequently used in areas like construction, engineering (consultants), legal services (lawyers) and utilities. The formula of cost-based pricing is

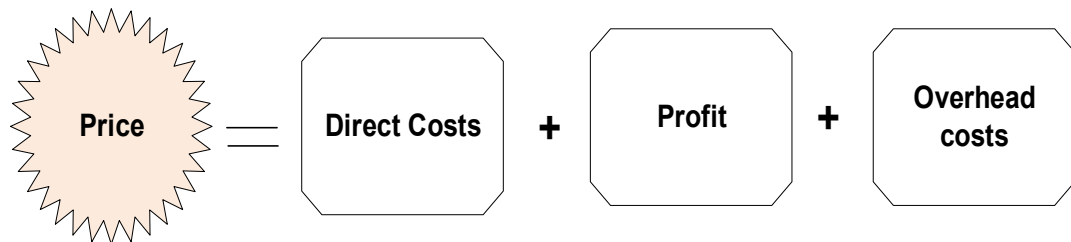


Figure 7 Formula for cost based pricing

Direct cost is actual expenditure (resources and labour used to produce services).

Overhead cost is expense incurred for human resource, rent, taxes, insurance etc.

Profit margin is % factor of full costs.

It is very difficult to define unit for service purchase and hence price per unit is vague entity for service pricing. Therefore, many services are not sold in terms of measured output, instead they are sold in terms of input units. One strategy is using cost-plus pricing where component costs are calculated in addition to a mark-up. It is typically used in industries where it is essential to calculate costs in advance such as construction, site activities or engineering. Professionals, for example engineers, technical consultants etc., use pricing strategy also called as “fee for service”. This strategy represents cost of time used for providing the services.

### 2.3.2 Competition-based pricing

This strategy considers pricing charged by various competitors in same industry or market segment. This method is used either in case of standard services or if competitors are few large service providers.

In service business, price signalling take place in markets when there is high concentration of sellers. The price offered by one company will be matched by other competitors almost

immediately. One of main challenges in this pricing strategy is that in case of heterogeneity of services, offered by the service providers, it is not appropriate pricing method to use. It does not consider actual cost and demand level of service in market.

Daria (2017) stresses on need of competitive price analysis to get an idea about market pricing. It demands companies to include customer data, product offering and market trend in price analysis.

### 2.3.3 Demand-based pricing

It is based on what customers will pay for provided service in certain market. It considers customer's perception of value offered to them. It is one of the major approaches used for pricing. In this approach, customer's perception of value is anticipated and is one of most widely used pricing strategy especially in service business.

Customer perception of value is very important factor that needs to be considered in demand-based pricing. Customer perception about value of service being offered varies intensively. Customer definition of value can be categorized as follows:

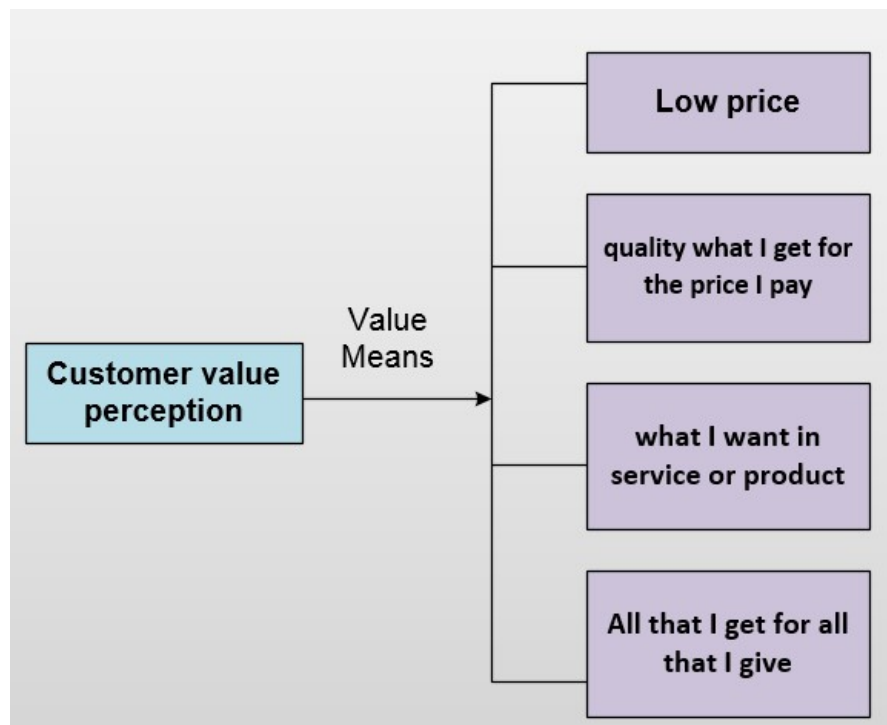


Figure 8 customer value perception of offered service

In demand-based pricing, non-monetary cost and benefits must be considered while calculating customer's perceived value for offered service. When non-monetary costs are required in service, monetary price must be adjusted for compensation. Whereas when services include

non-monetary costs, customer is more likely to pay a higher monetary price for service. It might be difficult to determine the value of monetary and non-monetary items from customer's perception.

#### 2.3.4 Price Differentiation

In this price strategy, companies sell same services or products at variable prices in different markets. It is also called as price discrimination (Krugman and Obstfeld 2003; Phillips 2005). Although price discrimination is allowed in different markets but to discourage any favour or competitive edge to certain group or company, marketer should make sure that such price discrimination does not violate any local laws (Dibb and Simkin 2004).

This strategy is mainly adopted in regions where buying power of customers vary a lot and they are willing to pay differently. Companies following this pricing model, tend to opt for maximum sales revenue at an acceptable value which is rather at low profits. The bulk quantity results in generating larger revenues and result is substantial profits. One of necessary condition that promote this pricing model is that company should have competitive edge or power so that there is no competitor in market (Economics Online 2019).

This price model gives supplier more control over pricing of market and higher potential to charge consumer at desirable price. However, price difference that tend to create authority to company for creating a monopoly might have legal consequence if it gets detected. (Grundy and Griesiene 2011).

#### 2.4 Service Quality and Pricing

Quality is an important factor that contributes to overall price, both for tangible products and services. Anderson and Zeithmal (1984) highlights that research shows service quality gives strategic benefits in capturing market share and return on investments. Service pricing is critically linked to service quality in the sense that generally consumer perceives the quality of the service based on the pricing.

Lewis and Booms (1983) share that If the service price is too low, it may give a sense of low-quality service. Whereas high pricing may trigger consumer to have high expectations which in reality may be difficult to meet in service delivery. So, pricing of service needs to be done in a smart way to give realistic perception to consumer about the quality of the service and hence attain customer's interest.

Storbacka, Strandvik and Grönroos (1994) discusses that service price is connected to the expectation of customer. It might be the case that low quality service is still acceptable if it fits budget of customer. Storbacka et al. (1994) gives a paradigm shift in areas of service quality and customer satisfaction. It highlights general assumption made in service quality that

quality lead to profitability. This study emphasizes that this assumption needs to be verified to evaluate true cost of service quality. It gives new perspective to traditional quality approach and highlights important elements in chain that impact service quality, customer loyalty and profitability.

Traditional approach:

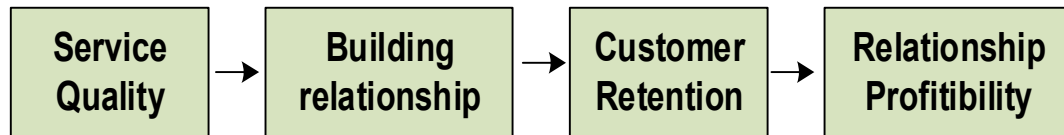


Figure 9 Traditional approach

Author adds new perspectives to the sequence (highlighted in white)

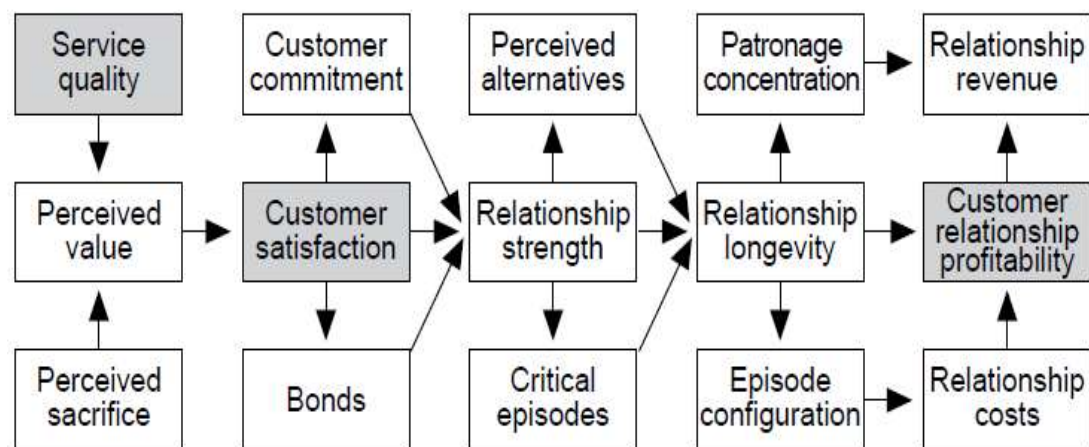


Figure 10 A relationship profitability model (Storbacka, Strandvik and Grönroos 1994)

## 2.5 Quality Control tool

Ishikawa (1989) is a well-known Japanese quality control expert. He is given credit for his extensive work done in area of quality control. One of his most important invention is the fish bone diagram. Ishikawa (1985) highlights quality as the most powerful marketing weapon. Fish bone diagram is easy to understand, visualization tool that can help employees in big companies, having broad range of product portfolio, to identify and avoid issues in their processes that can lead to bigger problems.

This tool works best when utilized in brainstorming sessions involving multiple stake holders to focus on key issues. Fish bone diagram is widely utilized in other quality control techniques as well.

Quality tool, fish bone diagram, offers the following benefits:

1. It can be used in workshop on brainstorming with people from various departments to work in synchronism.
2. It helps in identifying multiple key root causes simultaneously.
3. The visualization offers quick view of gathered points and is easy to follow.

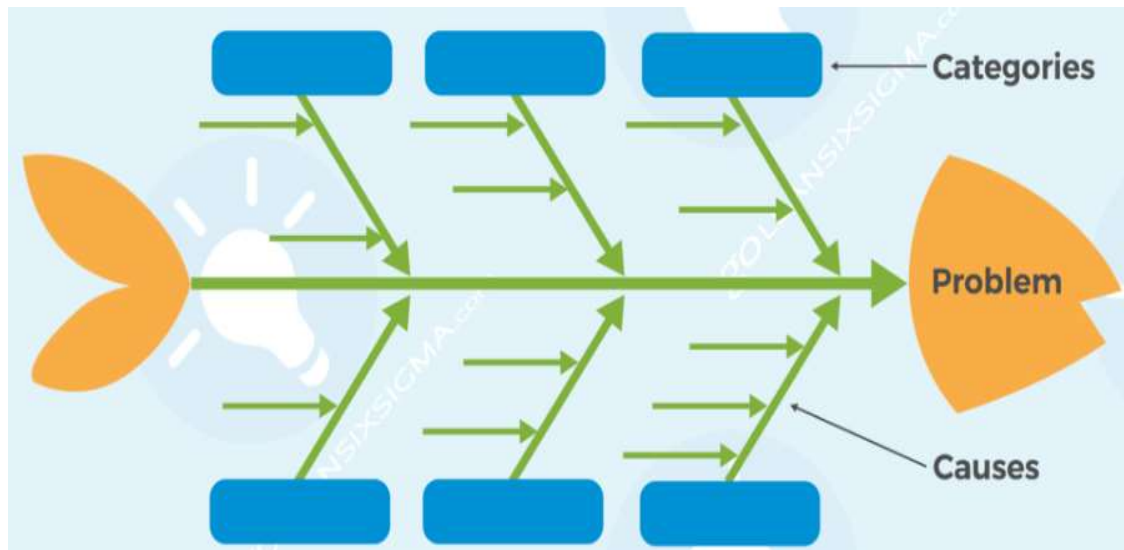


Figure 11 Fish bone diagram (<http://goleansixsigma.com>)

## 2.6 Case Studies

Company XYZ, under discussion is a market leader in area of electrification and automation solutions for marine business. This company is positioned globally in over 100 countries and is one of the key companies providing electrification to utilities and consumer around the globe. This company has always been a pioneer in development of new technologies by investing in research and development. In marine business, this company offer a wide range of products and service. It mainly acts as a solution integrator for the whole electrification scope of ship, from propeller to the bridge.

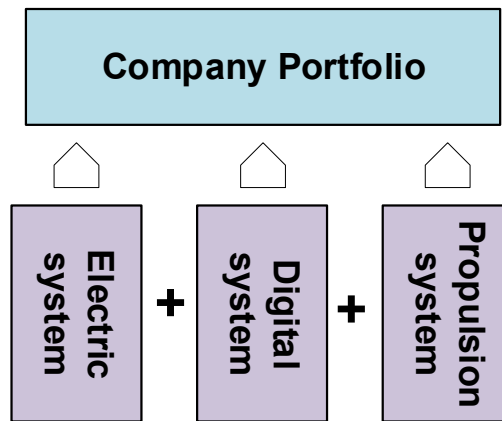


Figure 12 Marine Company XYZ portfolio

Company under discussion comprises of three main divisions as highlighted in above figure. Each of these division has further sub divisions and are based on certain products and services respective to that division.

### 3 Service design Process

Services are defined as intangible interactions that are tied to experience. According to Kotler and Armstrong (2001), a service is “any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything”.

Service design has evolved rapidly in past couple of years. Morello (1991) has described service design evolution and emphasize that it emerged as a contribution to a changing context and defines possibility to what a certain group of informed thinkers can do.

Deeper understanding of services and service design is made possible by introduction of the interaction perspective that has made up liaison with research and interactive design methodology. This concept was presented by PhD research by Pacenti (1998). She is known for her valuable contribution in the area of user experience and service design. This contribution has made it possible to see benefits which service design (focused on the service interface) can offer between Service Management (focused on service organisation) and Service Marketing (focused on service offering and market).

One of the major application area of service design process is in the development of new services that are based on user-oriented research and analysis. The tangible part of service that a user experience can be termed as service interface. It consists of people, products, information and environments that will support user experience (Sangiorgi 2009).

Service design tools and methods are similar compared to qualitative research in the sense that both are holistic and creative processes that demand intense contact within a real-life goal (Madden and Walters 2000). Service design process and tools tend to make a bridge between working and innovating (Brown and Duguid 1991).

This chapter focuses on answering main research questions highlighted in chapter one and discusses application of service design process that are utilized in overall approach in estimating the service pricing for the case study.

#### 3.1 Service design benefits

Service design is playing a vital role in offering businesses sustainable and profitable value proposition that has a positive impact on firm’s financial, operational and human resources which is critical to both established and emerging businesses, specially start-ups.

Levitt (1972) highlighted importance of service design by following statement “There is no such thing as a service industry. There are only industries whose service components are greater or less than those of other industries. Everybody is in service”.

Author Gummesson (2006) highlights benefits of service design and writes that it identifies needs of users' in elaborative way, while involving all relevant stakeholders throughout entire service process, and wisely taking into account interaction between services and users with goal to attain customer satisfaction and user engagement.

### 3.2 Co-creation and its benefits

Studies have shown that value creation is core key in any business sector and based on re- search it is quite evident that value creation concepts have been revolutionized. Previously, by default, firms were focusing their own resources for imparting value to its service but now end user is considered as main driving factor along with firm for creating value.

Co-creation considers active interaction between end-users and service designers of the firm during entire service development process. It is a collaborative effort between customer and service providers (Moritz 2005).

According to Vargo, Maglio and Akaka (2008), value and value co-creation are core purposes of services, which implies collaborative and interactive exchange of the value between service provider and service user.

As Stickdorn & Schneider (2011) identifies end user as key element and mentions the significance of putting end user at core centre of a service design process. Potentially, this is not a single customer group, therefore service design should take into account needs and expectation of each customer group.

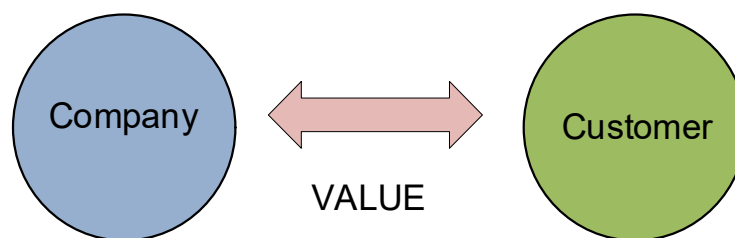


Figure 13 Co-creation enhances values for both parties

Keeping in view importance of co-creation, all relevant stakeholders and key end users have been involved in research process (ethnographic research) and also in brain storming sessions (workshops). This has helped in focusing on core problems and challenges hidden in new price estimation tools. It also tends to bring validation of process developed for devising cost estimation tool. The outcome from tool will be validated by series of iterations and by comparing it with real project figures that have been executed.



### 3.3 Design thinking and service design process

During last few years, design thinking has contributed to innovation process and facilitated it by introducing tools and supporting theory which has gained great appreciation from research communities worldwide. Design thinking tends to develop and nurture equitable thinking into innovative idea. It is focused on human thinking and proposes human centred approach that develops empathy for target group and observe behaviours. Most differentiating aspect of design thinking is that it promotes interdisciplinary collaboration and targets main project and its solution rather than highlighting the complexities or problems.

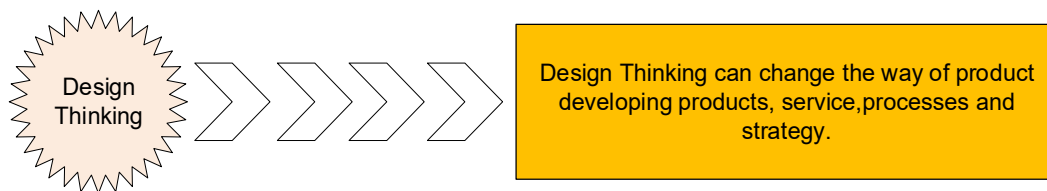


Figure 14 Co-creation enhances values for both parties

There is a wide a variety of models under umbrella of design thinking that have been developed over passage of time. Good thing about these tools and models is that these methods are not rigid protocols that need to be followed strictly. Instead it provides a framework that one can adapt according to task at hand depending on outcomes needed or based on available time and resources.

One of the most widely used tool in service design projects is “The double diamond model”, developed by the British Design Council in 2005.

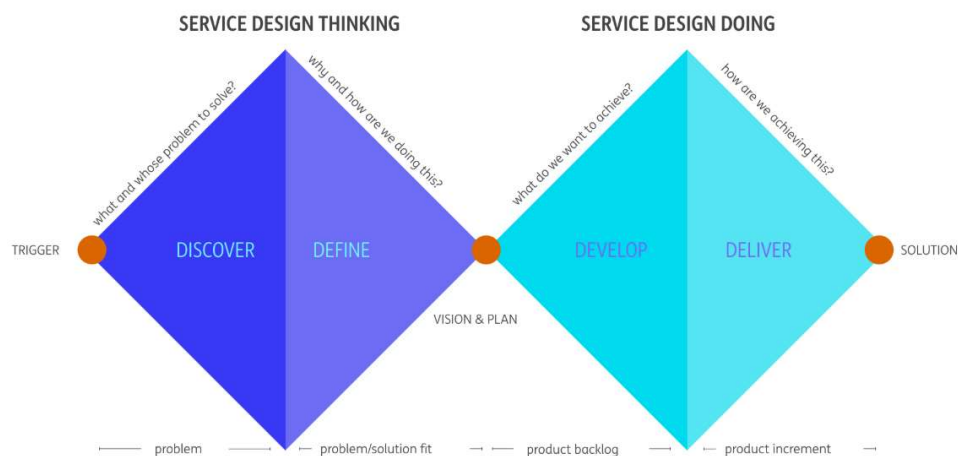


Figure 15 The double diamond model (<http://www.ing-experience-design.com>)

As evident from diagram, double diamond model comprises of four distinct design phases called discover, define, develop, and deliver. It maps design process into points where thinking and possibilities are broadened to explore and narrowed to focus on prime objectives (Design Council 2005).

#### I. Discover

First quarter of double diamond model takes into account start of the project. Service designer needs to mark challenges, shortcomings and problems of task at hand. The designer should try to understand main goals of service and try to explore in a new way, notice new things and tend to gather insights. Key focus is to see things from a new perspective and accumulate insights.

#### II. Define

In second quarter, aim is to map all insights gathered from phase 1 and make sense of all possibilities so that it can open channel to actionable tasks. These are then aligned with organizational needs and business objectives. This creates a list of items that can be scrutinized in terms of priority and feasibility keeping in view main objective and available resources. One important point of this exercise is not to avoid mistakes as it is more beneficial to rather explore and learn from mistakes.

#### III. Develop

Third quarter takes initial design brief from previous step which consists of ideating and concepting. Now through an iterative process of developing and testing, we get outcome prototype of product or service concepts until they are ready for implementation. One challenge is to prototype intangible services concepts. It may require extra efforts to prototype services in an environment which is identical to reality.

#### IV. Deliver

Final quarter represents delivery stage of process where resulting project (method, service, product etc.) is finalised and produced. Resulting project is launched and should target intended goal which is identified in phase 1, Discover. It also includes final testing, evaluation and improvements done by feedback loops.

Design flow of this research is based on above mentioned service design process. In this thesis, I have utilized application of double diamond model owing to its iterative nature and ease of application that I believe would be helpful in improving and also refining the solution.

### 3.4 Phase - 1 Discover

As highlighted in above section, this phase is start and fundamental part of the service design process. In this phase, main goal is to get a clear understanding of problem and gather insights from perspective of current and potential customers. It is crucial for successful service design to explore and understand service-users' needs.

In this case study, focus will be to collect limiting elements that are causing error in right cost estimation, in current cost calculation model. In this early phase, we will use two tools namely quantitative and qualitative research tools. These two tools will act as means to accumulate all information available to form a firm foundation from which, we can find available alternatives.

#### 3.4.1 User research methods

Research approach is beneficial in sense that it encompasses a broad range of different techniques ranging from broad assumptions to meticulous methods aiming for data collection, interpretation and analysis (Creswell 2014).

Research methods are broadly categorized as quantitative and qualitative. Although it is hard to make a dividing line between these two research methods but Bacon-Shone (2013) specifies that sometimes it is differentiated by type of data collected namely directly measurable (quantitative) vs. recordable (text, audio, video etc.) (qualitative).

##### I. Quantitative research (Statistical research)

For simplicity it can be said that quantitative research concentrates on statistical or empirical data. As the goal of this thesis to develop cost estimation tool, therefore, statistical analysis gives the overall performance and authenticity of tool by making comparison data with tool output vs actual data. The statistical analysis is easy to understand and gives user quick understanding of financial data.

##### II. Qualitative research (Ethnographic research)

Second one, qualitative research is categorized into those methods that tend to emphasize on maximum collection of data by focusing on one particular topic or subject for a period of time as identified in Newman and Benz (1998). This method is applied in area of ethnographic research, document studies, observational and interview studies etc.

I have performed ethnographic research as I consider it to be very beneficial in gathering of information for given task. Interview was conducted with relevant stakeholders involving key persons ranging from commissioning engineer, project managers,

head of project management, technical bid managers and sales support manager. Interview template, practices and guideline were based on material recommended by author Portigal (2013).

### III. Mixed research

Recent publication (Creswell 2014) defines another research method called mixed research method that is based on combination of both qualitative and quantitative methods. I have utilized this research method in my thesis as it gives a holistic view of research problem that is essential for my thesis. In order to get a solid understanding of hidden key factors resulting in wrong estimates in current cost calculation method, I decided to choose mixed research method.

#### 3.5 Phase - 2 Define

In this phase, all key insights are analysed to formulate a clear definition of fundamental challenge or problem to be addressed through a design-led product or service. Based on discovered key insights, we will focus on important issues to tackle in this case study. This phase will shed a clear light on definition of problems and it will help in interpretation of challenges.

The main objective of this phase is to make a list of actionable items sorted in order of priority or feasibility by keeping in view main objective of project.

##### 3.5.1 Workshop and Brainstorming

This is one of the most essential ideation tools which involves working with group of people belonging to different area in a logical and structured way, in order to collect and generate alternative thoughts and solution to problem. Key goal of this ideation technique is to produce a concise set of ideas rather than making long list of either viable or non-viable solutions. After collection of precise ideas, it can be taken forward and further improved.

It is of utmost importance that workshops, and brain storming session are well planned and done in controlled way. During start of session, facilitator informs the participants about rules, then engage all participants to contribute and build ideas focused on the topic at hand. This enables to generate most important set of productive ideas.

Osborn (1953) shares his experience in his book that how he was able to develop improvement in quality and quantity of ideas produced by same employees who were first thought to be non-innovative. Brainstorming should target out of box thinking and support breaking out of traditional thinking patterns. Session should be equipped with tools and roadmap that helps in evoking creativity and generate innovative ideas.



Figure 16 Key elements in a workshop (<https://www.process.st/brainstorming-process>)

I conducted workshops with different key stake holders and kept the guidelines as per the above figure. This helped in good discussions and collection of useful ideas for developing new cost estimation tool.

### 3.5.2 Personas

Personas are defined by bringing together lots of information about similar group users to create a single character that represents the group. Within a group, all users have similar activities, attitude and behaviour. This is valuable synthesising and sharing large bodies of user research. It focuses on needs of users. Personas can be represented through visual materials for enhancement and recognition.

Personas are very beneficial in understanding end users. This can help service provider to develop service keeping in view actual situation and demanding factors of intended user. In organization that is serving a broad category of users, it is almost impossible to tell story of what life looks like for a customer currently and how they would like that to change in the future. To cater this issue, segmentation of user data is done in order to structure research and identify key personas.

Based on extensive research, I learnt that user group has different needs for site activities costing tool. So, in this thesis, different personas are considered for site activities cost tool.

User group for site activities is based on vessel segmentation. This is explained in next chapter in detail.

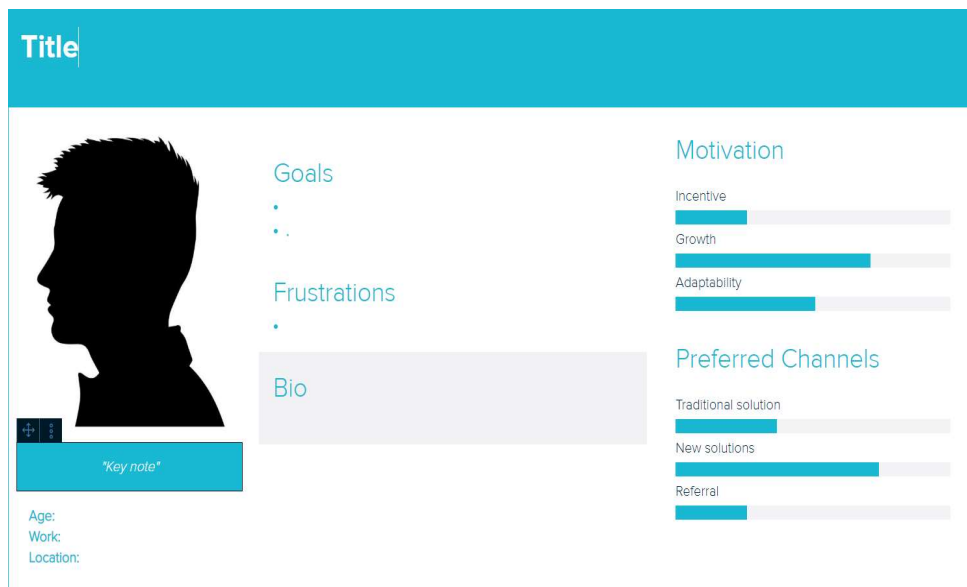


Figure 17 Persona template (<https://xtensio.com/templates>)

### 3.6 Phase - 3 Develop

It utilizes information collected in last two phases. Solutions or concepts are created, prototyped, tested and iterated in this phase. Stickdorn (2011) emphasize on the fact that end users need to visualize whole service concept to clearly understand way in which service will work. Therefore, it is vital to prototype ideas in a state that are close to reality.

#### 3.6.1 Service blueprint

Service blueprinting is an innovation technique that can help in boosting service characteristics and solving related management challenges. It evolved as a process control technique for services that offers numerous benefits like solving problems preventatively, and also it can identify failure points in a service process.

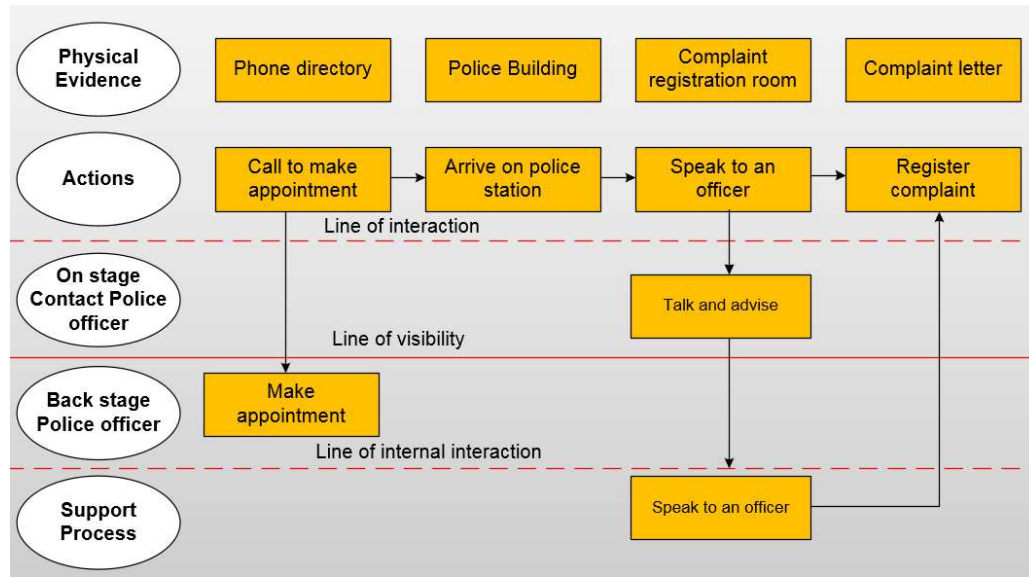


Figure 18 Example of service blueprint of a police station

It allows firms to visualize service processes, points of customer contact, and physical evidence associated with their services from their customers' perspective. Moreover, it also illuminates and connect fundamental support processes throughout organization that drive and support customer focused service execution. Authors describe that service blueprinting has been incorporated as a highly effective and very adaptable technique for service innovation, quality improvement, customer experience design, and strategic change focused around customers (Bitner, Ostrom and Morgan 2008).

In this thesis, service blue print is created by useful input given by firm's stakeholders and to create a common understanding of service process. This will help us in understanding services offered and map financial costs associated with it.

### 3.6.2 Rapid prototyping

In this step, rapid prototyping is done based on collected data from above steps. It can be done for products as well as for services. Especially in service related businesses, it is a great experimental tool for understanding and testing user experience. It gives real world feedback from end users that helps in improving services or products which in end ensure better and more relevant outcomes.

Rapid prototyping does not have to be concise and detailed, rather it can be quick and cheap, so it should not consumer extra time and resources. This stage allows a solution to be iterated and improved before it is rolled out. It is a great way of developing an idea tangible from an early stage through cheap mock-ups which eventually helps in saving resources and lower risk of failure in the end.

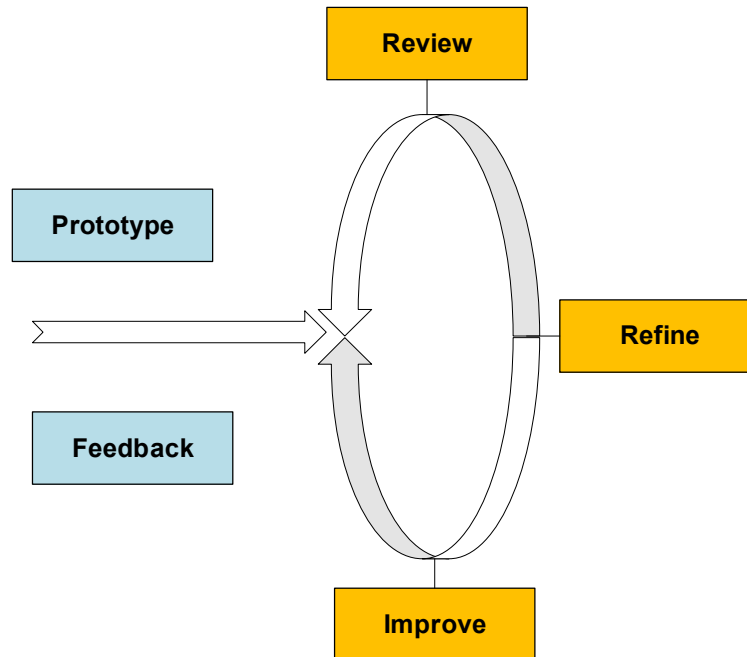


Figure 19 Process of prototyping

Based on above prototyping process, feedback from end users which consists of interactions and touchpoints, is reviewed to point out shortcomings and pitfalls in existing service. It is then refined to consider needs of users. The next step is to improve solution by eradicating deficiencies contributing to errors.

### 3.6.3 Business model canvas

It is basically a framework of a company that defines how company creates value for itself and its customers. It shows guiding framework that combines all the information generated from development work done during innovation process. It is very practical and easy tool to highlight key elements and strategies involved in business model.



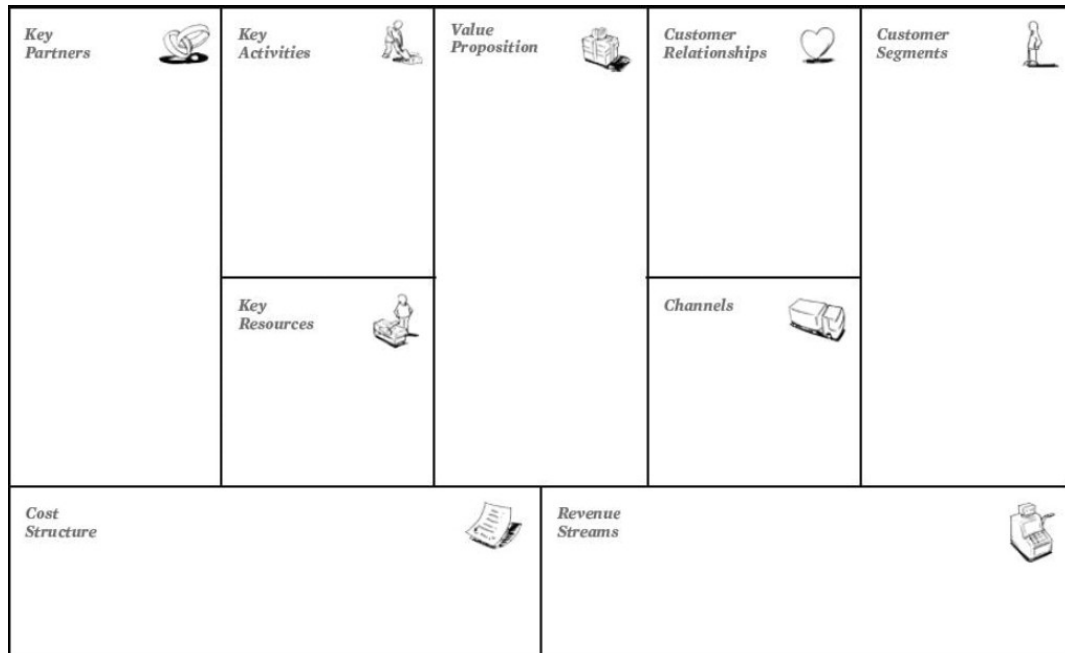


Figure 20 Business model canvas (<https://www.northforward.com>)

As illustrated in above figure, business model canvas consists of nine sections which are building blocks of whole framework. It visually shows the key activities occurring within an organization and helps in streamlining key activities. This can help to define structure of value chain required by company to create and improve offering. Complementary assets are identified which are needed to support revenue generation mechanism for company which finally estimates cost structure and profit potential in producing offering.

### 3.7 Phase - 4 Deliver

This phase consists of producing and implementing solution that are practical and working. Key focus elements of this final stage are final specification and production of working solution. In order to verify authenticity of solution, testing should be done. In addition, it is important to capture user feedback, especially from colleagues and relevant partners. In order to aim for continuous improvement, development process is shared and improved over the passage of time.

Development process of alternate pricing model has been done keeping in view resources, expertise, product portfolio, area of excellence and inputs from employees of company mentioned in case study. Then in the end, outcome of final cost estimation model is tested, by comparing it with actual cost reported in already delivered projects having similar scope of supply. In addition to this, output data of new tool is also compared with old pricing model to see the difference.

#### 4 Development process and findings

This section gives a brief overview of development work done in thesis for devising cost estimation model for site works. Before proceeding with details, process model has been developed to explain main approach utilized in this thesis. As this thesis comprises of comprehensive work flow, process model helps readers to map details and main objective throughout service design process. It tends to create simplicity out of complexity for facilitating readers. It helps in better understanding as each milestone during the thesis work has been mapped in below process model.

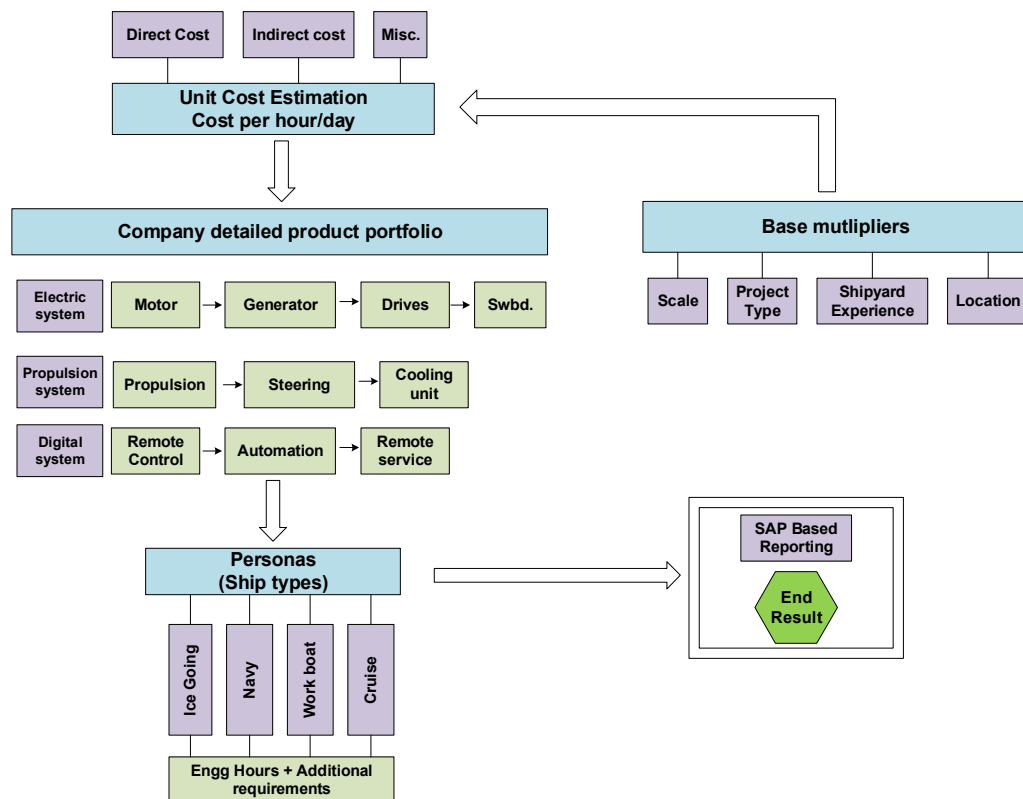


Figure 21 Process model for cost estimation tool

The process model is the cost estimation tool, developed for industrial site service activities and the main result of this thesis. The user of this process model tool can use the same service design methods in tailoring the tool for his specific application. Core task starts by selecting cost-based pricing models out of different available pricing strategies. In cost-based pricing, unit costs are determined based on calculation method listed in section 2.1. Based on product portfolio of the company, amount of site work is estimated in terms of man days required for each products' installation and project-based engineering work. For making calculations simple, different vessel types are categorized into four main ship types. For each ship type, fixed costs are estimated based on project requirement (e.g. engineering hours, length

and complexity of project etc.). This categorization helps in application of this model to all ship projects without requiring extra calculations. In order to reduce complexity, base multipliers are utilized in cost estimation for taking into account big variables (e.g. location of project, shipyard technical capability etc.) that can have tangible impact on project costs. After including all these factors, cost estimation model is prototyped and tested. The final model is implemented in Microsoft Excel to list result in a way that is identical to SAP reporting system used by the company XYZ. This reporting gives a possibility of check authenticity of tools by cross checking the cost predicted by tool and actual costs incurred after project execution.

#### 4.1 Summary of the Service Design process

The design process, followed in this thesis, comprises of four main phases. These main phases consisted of further stages which comprised of different activities for collection, analysis of data and devising basis for cost calculation method that lead to new cost estimation model.

Visual representation is the best representation of service design process, that makes it easy to follow and understand. I have also compiled overall service design process in graphical format in order to make it easier for readers to follow the analogy behind working process used in the development of new cost estimation model.

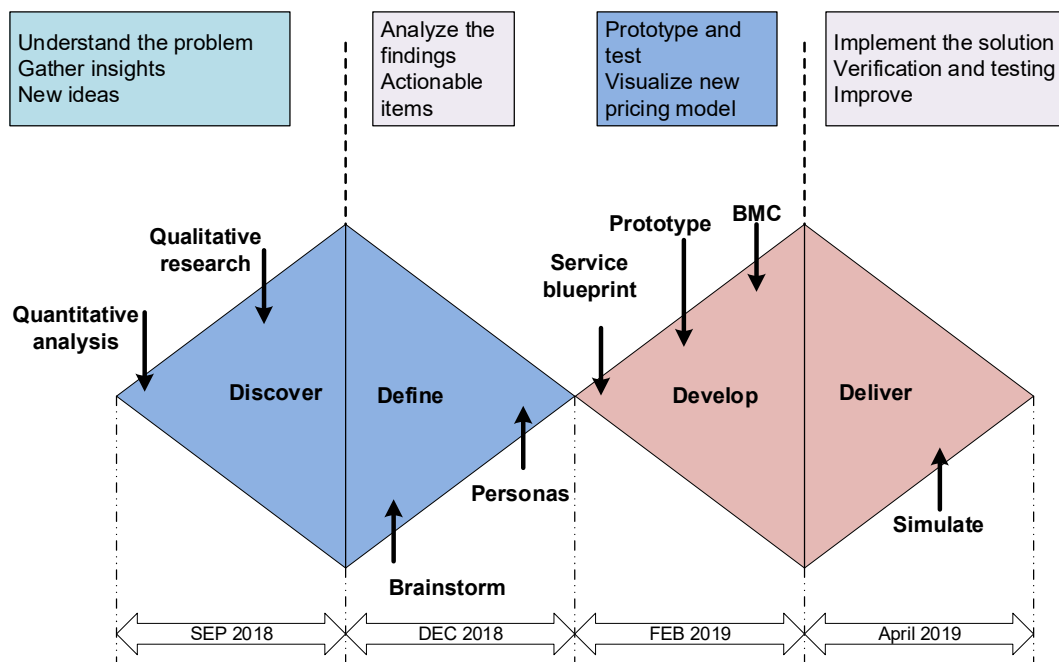


Figure 22 Overall service design process

Double diamond process model has been selected in this thesis as it involves emphasis on problem analysis that acts as basis for creating a solution for problem. Above figure sheds

light on various service design stages to double diamond model and give details about process and activities involved in each stage.

Above figure maps all important elements and shows key activities involved in making of new cost based financial tool. It describes main objective and progressive learning done in each phase of double diamond model. In addition to this, it also gives a glimpse of all service design tools and brainstorming session (workshop and interviews) in different phases of whole process, along with timeline.

A brief breakdown of major tasks with the intended objectives has been listed below for easy understanding of readers.

Service Design Phase	Tools utilized	Task details	Objective
<b>Discover</b>	Quantitative analysis	Understand the problem	Study old tool, define approach, find discrepancies
	Qualitative analysis	Analyze old tool algorithm	Update it or discard it
<b>Define</b>	Brainstorming session	Introduce new cost estimation method	Man Hour/day as unit, cost-based pricing
	Personas	Use Base multipliers for simplification	consider variation caused by different ship types, project specifics
<b>Develop</b>	Service blue print,	Make a user interface for new tool	See the process flow in new cost estimation model
	Prototype	Make a prototype	Test new cost tool
	Business model canvas	Link major entities	role of entities in business model, business model structure
<b>Deliver</b>	Microsoft excel	Implement the tool algorithm	Utilize in sales bidding process

Table 1 Task breakdown list

The above task list is in line with service design process and helps readers in grasping key concept during each step. Details of each design phase is explained in next sections.

## 4.2 Findings from user research methods

As mentioned earlier, I have utilized mixed research methods for conducting user research. User research can be divided into two parts based on my approach, namely ethnographic research (qualitative) and statistical or empirical data (quantitative).

### 4.2.1 Quantitative research

A detailed statistical analysis is done based on actual data from real projects and planned costs that were calculated from existing cost calculation method. This empirical analysis has been done for site activities. The goal is to find the error range in existing tool. This can give us a better understanding about accuracy of current tool. If error range is within limits, then existing tool can be modified or improved to give better or more accurate results.

The data used for this report is based on data that consists of 49 projects delivered between 2009 and 2016. This data has been extracted from SAP system (Data storage and processing system) of XYZ company.

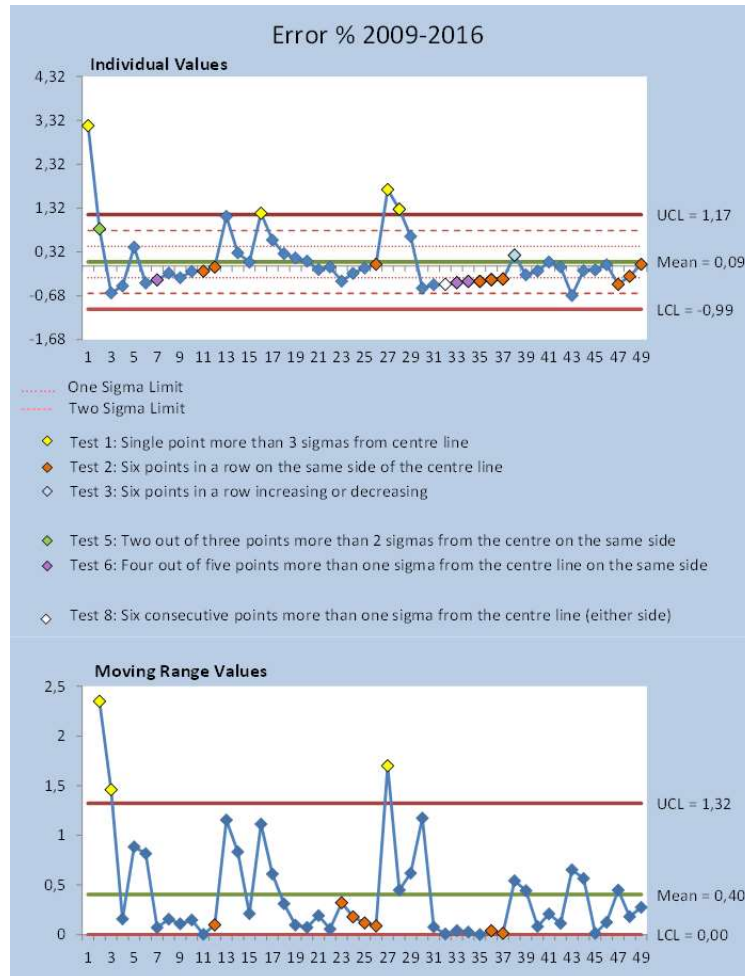


Figure 23 Comparison charts for projects offered between 2009 and 2016

#### Site activities

Out of 49 projects chosen for inspection, 32 had an absolute error larger than 50 000 euros in the field of site activities. In 24 of the projects, absolute error was more than 30 % compared to actual costs. Mean absolute percentage error was 42,0 %. However, on average budgets were 8,9 % overestimated compared to actual costs.

#### 4.2.2 Qualitative research (Ethnographic research)

In this thesis, numerous interviews were conducted with different stakeholders including employees from different department (engineering, commissioning, sales support, project management and site activities) of XYZ firm, for gaining a deeper understanding of existing cost estimation tool and its related issues. Key reason for using ethnographic research tool was based on fact that it is a very effective tool in getting people perceptions and perspectives through stories and their words (Kumar 2012).

First of all, in order to gather more understanding about limitations of existing cost estimation tool and to dig out problems associated with it, I started by conducting interviews with relevant key persons, that participated in making this tool. Main idea was to understand working principle of this tool and analyse if existing tool can be modified to rectify the errors embedded in the cost calculations.

Later on, interviews were conducted to get understanding of new features the tools should have and also gather insights from perspective of current and potential users. Main goal was to clearly understand scope and critical elements that should be incorporated in new financial tool so that it may fulfil its intended purpose.

In the end, information was also collected from the end users of the tool to highlight the challenging aspects of tool from user interface point of view. As it is very important that intended financial tool should have easy and user-friendly user interface, so that it can help its users to give input data in convenient manner and also to display output data which is easily readable. As this is only way in which tool can successfully serve its purpose.

As all the stake holders to whom interviews were conducted consisted of employees of the XYZ company, preference was given to conduct interviews through face to face meetings whenever it was possible to meet the person. As marine projects require extensive travelling, so it was hard to get access to people specially related to site activities. In that case skype interviews were conducted to collect input from relevant employees.

To wrap up summary, below table gives a detailed overview on number of interviews conducted with each stake holder, method of interview, also key benefits and insights gained from interviewees.

Table 2 Summary of interviews (qualitative research)

Department	Method of interview	Number of interviews	Key findings
Engineering	Face to face	2	- Understand working principle of current tool - Limitation of current tool - Engineering hours needed for standard Vs customized projects
Commissioning	Skype	2	- Check the real cost of installation - Verify the scope - Allocation of man hours for installation, supervision and commissioning

Sales support	Face to face	4	- User interface - Input /Output data representation - Requirements associated with different vessel segments
Project Management	Face to face & Skype	2	- Project hours allocation in various shipyards - Challenges in project management for different projects
Site Management	Skype	2	- Site supervision needed in different projects - Additional site requirement for special projects - Categorization of site activities costs based on geographical area and vessel segment
Total number of interviews		12	

A proper field guide and question template was made before conducting interviews. Details of field guide can be found in the appendix 1 of this thesis. During interview, I made rough notes about relevant answers given by interviewee. It helped in catching up points that I forgot to memorize during the process of interview. Data in the notes was processed in order to get important key insights, build empathy, incorporate user point of view and benefit from key learning from the user's experience. Road map followed can be summarized from following flow chart.

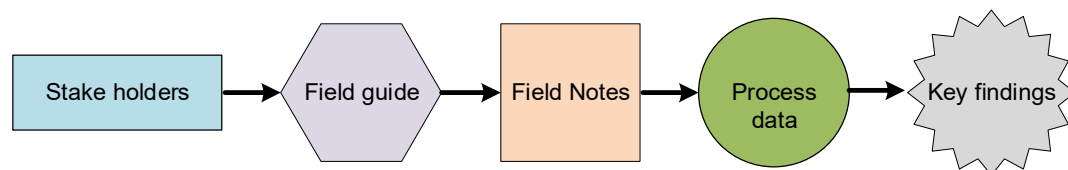


Figure 24 Road map followed in interviews

As employees were working in different areas of company, having diverse expertise in their field, so questions were not exactly same for all interviewees. Also, interview duration and interview progress speed were diverse for different interviewees. Interview duration and questions were customized based on available time and progress of interview.

Stakeholder's interview proved to be quite beneficial in providing clear understanding about current cost estimation tool, its working principal, limitations and expectation from users related to new tool.

#### 4.3 Workshop and Brainstorming:

This is one of the main stream activities in this thesis and key learning from this phase made foundation for new cost calculation tool. In order to process and converge gathered



information from previous stages, I conducted a workshop with participants from sales support team, project and quality department of firm XYZ. Main aim of workshop was to analyse key findings and short list actionable items from the input of participants. The workshop started with briefing about basic rules of brainstorming highlighted in earlier section, then we spend 1 hour building constructive ideas about new tool. In the end, half an hour was given to finalize action list and filter gathered ideas.

This session helped in quick processing of information collected in initial stages and screen out the most tangible actions for new cost estimation tool. Following is a short summary of tasks completed in the session:

- **Old cost estimation tool:** First main task was to see if old cost calculation tool can be rectified to reflect desired changes and improve its results. During workshop, brief analysis of the old cost estimation tool was done by breaking it down in various categories and opinions were collected accordingly. Collectively it was agreed that old tool was not good enough and had complex algorithm. So, it was decided that, no effort should be spent on old cost calculation tool and it should be discarded as such. This helped in clearing out action list and all the needed milestones were planned to keep in view the goal to make a new cost estimation method for site service activities.
- **Product portfolio:** One of the basic items that old cost estimation tool was missing was the overall product portfolio. Based on the input from individuals in workshop, product portfolio was updated and defined so that it should be streamlined in new tool. This is very important part in the cost estimation that user should be able to select right items in new tool in order to estimate correct pricing.

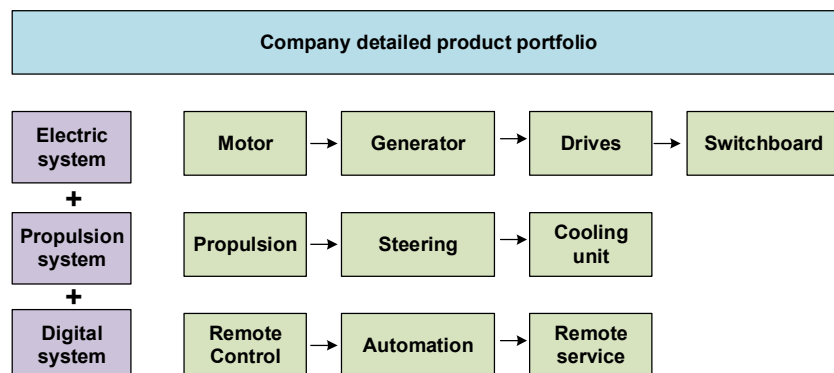


Figure 25 Overall product portfolio

- **Tangible factors:** Based on expert input of project team, it was learnt that site costs for same scope can vary significantly based on variables like location of site, prior

knowledge of shipyard about technology and also on the complexity of the project etc. In short, many useful findings were generated from workshop and it was clear that new tool should be adapted to consider these factors. It was evident that old tool lacked this feature and was giving cost estimation based on scope selection irrespective of location selection/complexity of project.

- Key issues: As company under discussion has a large product portfolio with diversified service offering ranging from retrofits, modernizations to new builds, it was essential to focus only on key issues hidden in complex site service matrix. Fish bone diagram helped in achieving this milestone and identified key root cause faced in projects. Details of the fish bone diagram can be found in the appendix 2.

#### 4.4 Personas of new pricing model

Personas are important in the sense that it characterizes profiles which give details about needs of user that will eventually be utilizing the service (Van Dijk, Raaijmakers & Kelly 2011). For creating personas that can help me in developing new costing tool, I utilized plenty of information from research insights gathered in discovery phase. In quantitative and qualitative analysis, it was learnt that marine projects can be categorized from prospective of vessel segment in following categories:

##### I. Cruise vessel

This is a vessel segment which consists of large equipment deliveries and follows standard execution protocols strictly. The timelines are quite strict, and it may demand site work on multiple shift basis or on weekends. Yards executing this kind of vessel are usually skilled and have been working with company (highlighted in case study) for some time, so these yards are already familiar with the company's working procedures and principles of project execution.

##### II. Navy vessel

This is a special vessel segment which demands plenty of work which is different from standard project execution. Site services needed for this kind of projects take much longer time than a passenger vessel of similar size. Every naval marine project is taken as customized project and may require special skillset from site activities personnel. Normally these vessels have much bigger budget and it demands extra performance requirement from equipment installed in these vessels.

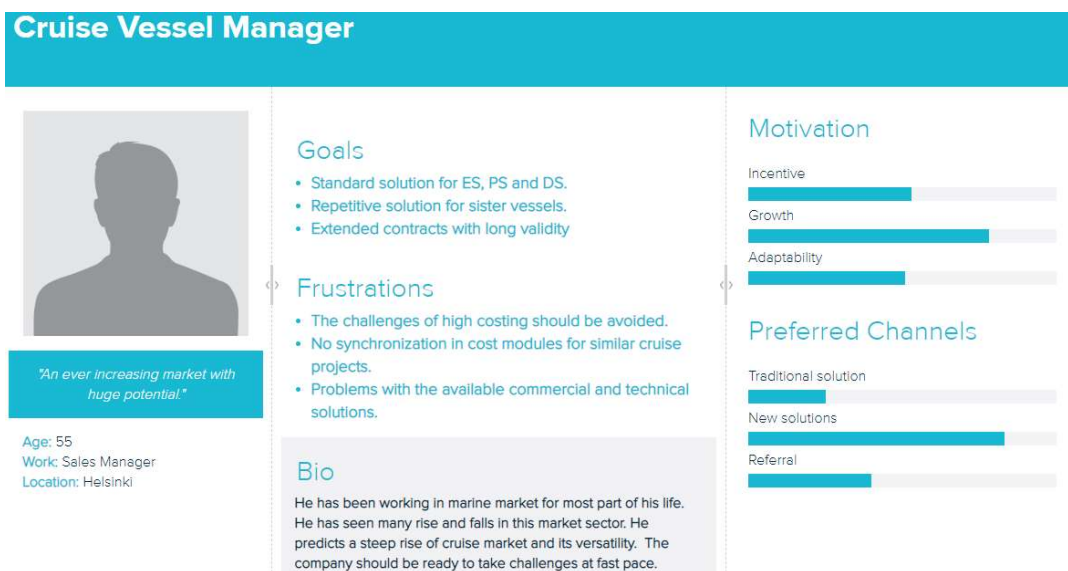
##### III. Work boat

It consists of broad portfolio of vessels namely research vessel, dredgers, platform supply vessel, offshore supply vessel etc. This vessel segment requires customized solutions which demand a lot of engineering but on contrary to navy ships, it does not have long lead times for project execution. For installation and commissioning, standard equipment installation and guidelines are considered that makes site activities to follow standard protocol.

#### IV. Ice going Vessel

It is a very special segment. Unlike other vessel segments in which vessel are operating in open (warm) water, this segment consists of vessels that are made to navigate in ice conditions normally in water that are frozen due to ice cold condition, near north pole or arctic circles. Equipment in these vessels is made extra strong to bear harsh ice environment and it demands specialized site skill-set for installation and commissioning of these vessels. These project demand special budgeting for project execution and project management.

For better understanding details of project execution of above-mentioned vessel segments, I interviewed sales manager, responsible of respective vessel segment. This helped me in creating personas which will eventually help me to keep focus on the customers' perspective for optimising working principals of new cost tool, during rest of the design process.



## Ice going Vessel Manager



*"Relatively old market with new endeavors."*

Age: 45  
Work: Sales Manager  
Location: Helsinki

### Goals

- Demanding solution for ES, PS and DS.
- Special weather conditions.
- Extended warranty time for equipment

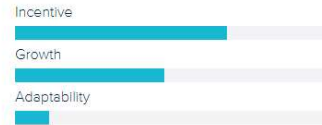
### Frustrations

- Tough requirements from the shipyards.
- Standard solutions are followed blindly.

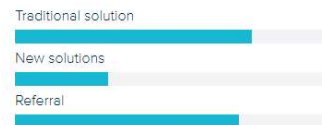
### Bio

This has been a relatively new segment in marine market. Now with the passenger vessel going for arctic visit, there is undoubtedly huge potential in this market sector. Although this market is still following traditional solutions.

### Motivation



### Preferred Channels



## Navy Vessel Manager



*"Huge budgets but very traditional approach."*

Age: 59  
Work: Sales Manager  
Location: Helsinki

### Goals

- Governmental approach for contracting and bidding.
- Tough requirements.
- Extra support needed for the project.

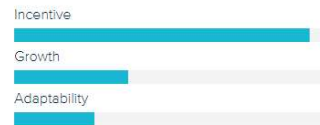
### Frustrations

- Very long lead timings.
- Extra margins needed for cancellations of contracts.

### Bio

With the defense budgets going sky high, there will always be long lasting thirst for making ships for official navy use. It demands particularly very long project timings, which can be twice as much compared to normal vessel of same size and specification.

### Motivation



### Preferred Channels

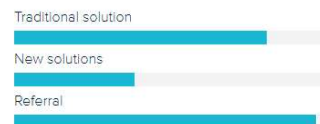




Table 3 Personas of main vessel segments

#### 4.5 Service blueprint: New cost estimation model

After collecting key value insights and new ideas from first two phases of double diamond model, now we move onto creating basis for new cost calculation tool. In this phase, we will make service blue print, by keeping in mind the fact that fundamental purpose of innovation is value to customer.

Main purpose of creating service blue print is to make a visualization of services offered to customer as this will help in better understanding of whole service offering, which makes it easier to allocate costing for each step. Based on collaborative workshop that was organized as part of brainstorming session, we already have collected ideas and new thoughts about new costing model. Aim now is to organize these thoughts and ideas in co-creating the service. Service blue print is a handy tool that can achieve this goal and create a visual document of how new cost calculation model should be provisioned.

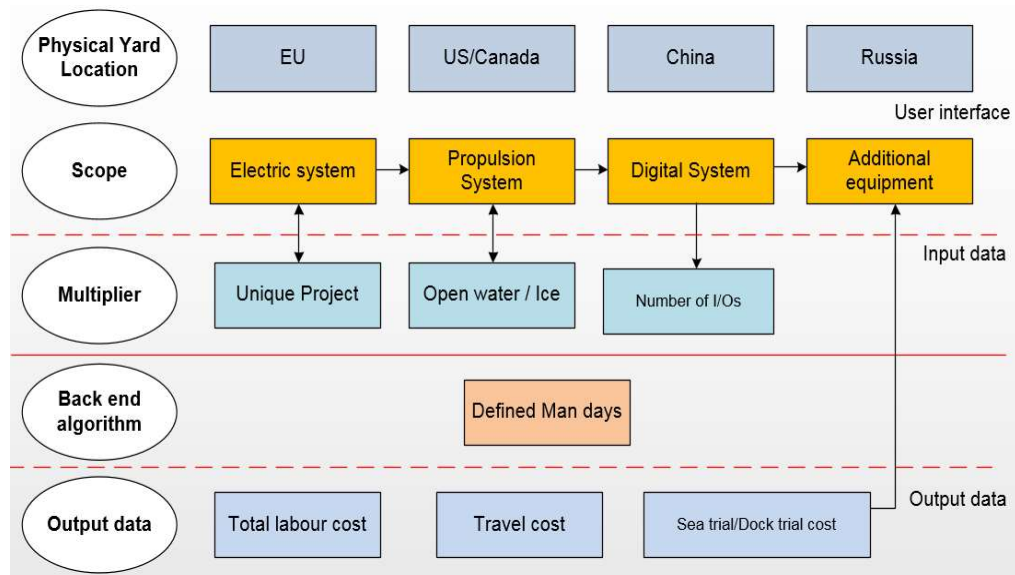


Figure 26 Service blue print

Cost calculation model was easy to understand after application of service blueprinting. It also helped to include deep customer insights gained in brainstorming sessions and qualitative research. Logical connections were built by connecting service propositions to actual cost parameters. This activity of service blueprint workshop involved brainstorming sessions by myself and few participants from sales support team members of company XYZ.

Above visualization shows key factors in cost calculation. First of all, in new cost estimation model, unit-based cost is defined for whole scope of project. The unit followed in cost model is based on man days used in site service operations. Amount of man days were defined for all major equipment used in marine projects e.g. for generators, motors, switchboard etc. Costs for man days are dependent on region where site activities are performed. In this case, company is utilizing different service rates for various regions around the globe. User can select specific region and cost calculation model will use the service rate of that region as base man day cost (Euros per man day).

Cost model is built on “cost-based pricing strategy”. New cost-based model calculates all direct and indirect costs. Direct costs consider all needed man days for whole site activity scope (site supervision, installation and commissioning, sea trials and dock trial tests) whereas indirect costs include travelling, boarding and lodging costs etc. In the end, profit margin is applied based on company’s policies.

#### 4.6 Outcome of rapid prototyping

In previous section, key algorithms of new costing model are explained. In order to see its capability to calculate accurate cost for a given scope and also to judge its practicality of usage, I made up a rough but simple prototype model for the costing tool in program Microsoft excel. Major reason for choosing this program was based on friendly interface and easy usage. Key purpose was to get a holistic picture of new cost calculation tool.

For collecting factual feedback from users, I chose few participants which consisted of employees of same company XYZ. All these participants are part of team that makes commercial and technical proposals for new sales marine projects, so their feedback was very important and crucial for new cost estimation tool.

I walked through the new costing tool with above-mentioned participants. To summarize, below table gives an explicit synopsis on interactive sessions conducted with each stake holder, method of interview, also key learnings gained from the candidates.

Designation	Number of Participants	Key learnings
Technical Bid Manager	3	<ul style="list-style-type: none"> <li>- Feedback about basic principle of new tool</li> <li>- User interface</li> <li>- Summary list to contain certain items</li> </ul>
Sales Support Manager	1	<ul style="list-style-type: none"> <li>- Output data fine-tuned</li> <li>- Addition of equipment in the scope</li> <li>- Corrected technical flaws related to equipment</li> </ul>
Project Head	1	<ul style="list-style-type: none"> <li>- Correction of multiplication factor</li> <li>- Service rates updated</li> </ul>
Total	5	

Table 4 Summary of feedback about the prototype tool

Majority of the participants were positive about new cost estimation tool compared to the old one. Although every individual had a preference but they all seemed to agree on common user interface which can of course be tailored and improved with the passage of time. Initial feedback was good enough to continue with prototype model and refine it further.

It's understandable that new costing model cannot be verified completely at this stage and should be tested on different scope of projects with more users, but this was not main goal at this stage. Detailed analytics and rapid testing can clear up doubts of impurities in new cost estimation model. Key idea was to get initial feedback and thoughts from users about it.

Keeping in view scope of this thesis, main focus was given on key learnings from this first set of iteration. Strong oral and psychological feedback of participants in interactive session gave a green signal about the practicality of new costing model.

#### 4.7 Business model canvas: New pricing model

Business model canvas (BMC) for new cost calculation model is drawn as per template highlighted in the section 3.6.3. BMC is good in the sense that it shows the link, benefit and role of all major entities involved in the process. Detailed BMC is made for this costing model and can be found in the appendix 4, at the end of this thesis.



## 5 Discussion

In previous chapters, we discussed entire process that lead to development of new site services cost estimation tool. In this chapter, major focus is on key differences, new cost estimation tool offers in comparison to the previous version. Also, intention is to report pit falls which are learnt in entire process that can be avoided by other user when applying service design tools for developing cost calculation tools.

### 5.1 Comparison to existing pricing model

It was quite clear from the background research that existing costing tool had many shortcomings and that alternative cost estimation method was needed to address the gaps in current monetizing model. The major differences are explained below:

Major constraint with the existing costing model was its complexity. Old cost calculations were built on complex formulae that were relying on old design and architecture of products. Now when products have changed with passage of time, it was almost impossible to work out with old formulae to reflect the changes which new products would have on site activities cost incurred during commissioning of equipment. Main change was to get rid of complex formulae and use general approach for calculation of site activities for each product.

New cost estimation tool follows a modular structure and utilizes one unit (man days) for each equipment for cost calculation. Using man days as one unit for cost calculation reduces complexity of utilizing formulae for various equipment. Man-days can be used as base for estimating installation cost of diverse equipment portfolio without making any complexity in cost calculations. Although forecasting man days for equipment installation is not very straight forward. This task was done based on outcome from interviews conducted by various experienced commissioning engineers, site supervisor and service managers.

One of the main benefits of new cost estimation model is its flexibility and modularity. The cost structure is made in program Microsoft excel and is structured in a way that it is fairly adaptable for making updates and changes. Especially in era of automation and intelligent technologies, there is rapid progress in technology that is changing products very quickly. New cost calculation tool offers ease to make changes and customize the tool to make it compliant based on intended requirements.

One major aspect, that was considered right from the beginning in make of the new costing model was the uniformity and simplicity of tool. Old tool was asking for too many inputs and results varied a lot in case inputs were missing. New tool was made fault free in case of false input or if input was not edited by user.

User experience was enhanced in new cost estimation tool. In old tool, outlook and user interface of tool was rather complex and was probably based on criteria and input defined by a single person. Aspect of user interface was well handled in the development of new tool by asking suggestions from range of different users. Prototyping stage helped in filtering out any undesired characteristics. This exercise helped in shaping the right user interface that was highly admired by users.

## 5.2 Learnings and outcomes

Main approach followed from start of thesis is to co-create with expected users of the tool. The contribution of service design helped in achieving this goal as it helps in making the approach empathetic and includes end user desires and emotions.

I have been working in the marine business for last eight years on different technical and commercial positions but still I cannot consider myself as an expert in marine business. Marine business is global and is changing at fast pace. My personal opinion in development of cost estimation tool was not enough. It was of utmost importance to take into account opinions of other users in entire process. In short, this thesis is an outcome of co-creation process that enabled me to make a tool which can serve its actual purpose for its intended users.

Major advantage that comes out of co-creation is creating of service tools that are targeting user needs. It decreases probability of failure and eradicate chances of devising a service that is not addressing actual needs of the users.

Another aspect that help in keeping the work right on track is involvement of right users throughout thesis work. It might sound like an extra effort and sometimes in big organizations it might be hard to catch up with the employees, but this effort is worth doing. In this thesis, most of the intended users are part of projects which are travelling most of the time. Although it was hard to arrange meeting with them and take their input but involving those users in all stages of work ensured that cost estimation tool is constantly improved throughout the thesis work period.

One of the main pitfalls that I learnt in this thesis work is selecting appropriate pricing theory without properly understanding the business model and infrastructure of organization. Formulation of financial modelling should be done keeping in view core activities of firm. Not to mention, tool development should take into account feedback from intended users. Although there are many financial tools and methods available that can be employed for developing a cost estimation tool, but successful implementation requires deeper understanding of business model and structure of the firm. Another pitfall is avoiding making a perfect prototype. I learnt that prototype for pricing model should be simple and should not consume too much

time. Prototype model will eventually change with passage of development process and too much effort should be avoided in initial phases.

As described in earlier sections, my thesis work has been mapped according to double diamond process model. Constructive ideas have been collected through various phases of double diamond model. This has helped in formulation of financial concepts which paved the way for development of new site service cost estimation tool. Double diamond model is divided into four phases as highlighted in figure below:

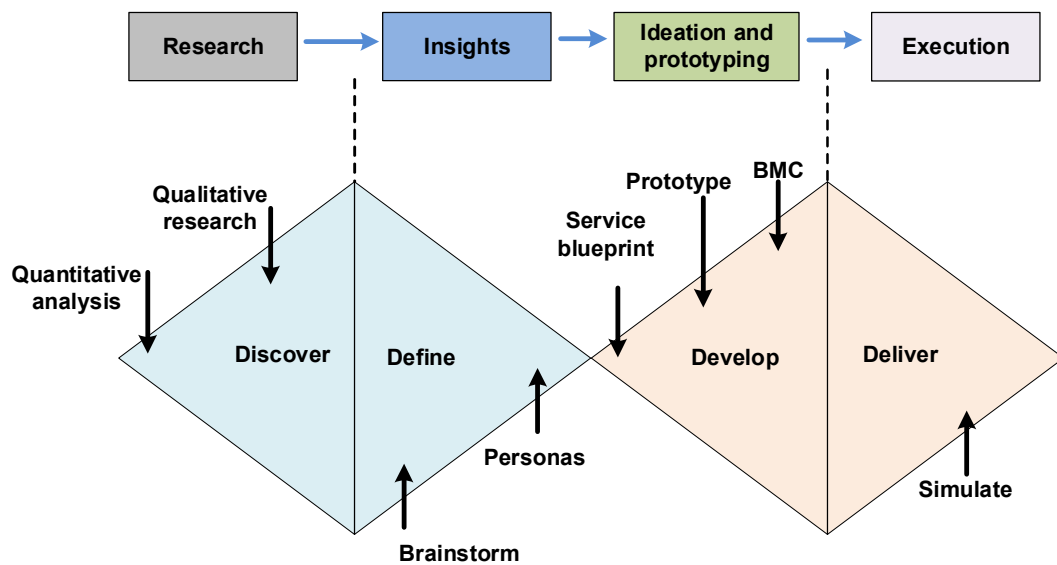


Figure 27 Service design process followed in the project

#### I. Research

This is starting phase of thesis where main emphasis was given to understand the problem. With research analysis, I was able to properly identify challenges that were present in existing site cost estimation model. This phase was divergent, and aim was to take into account as much information as possible. This helps in considering all available information that can enlighten a deeper understanding of problem and assists in finding the root cause. Research was based on qualitative and quantitative analysis that helped in gathering valuable data related to existing tool and associated challenges with it.

#### II. Insights

After collection of information from first phase, it was time to converge data so that meaningful ideas can be developed. Workshop was organized that helped in collecting eloquent facts about the loop holes existing in current tool. It became quite evident

that existing tool cannot be modified and there was a need for making a new tool under new principles. Key insights were collected that helped in grasping user's point of view and see the problem in light of collected facts. In workshop, product portfolio was made that was based on actual solution offering of the firm which was not reflected in older tool. This phase also helped in converging available solutions that could be utilized in current offerings. Different personas of vessel types were also studied in detail in order to better understand requirements of each type that can be accommodated in new tool.

### III. Ideation and Prototyping

In this phase, comprehensive work was done as it is divergent in nature where insights are converted into actionable items. Ideas are created based on input from previous phases and formulated to make a working model for new cost calculation tool.

It started with service blue print in order to get an overview of tool structure and service offering that should be built in new pricing model. Visual document was created in this phase that gave a clear picture of how new pricing solution should be provisioned. This gave a good idea about user's perception at various touchpoints. After this point, I already had a good understanding about basic building blocks of new pricing model and how it could be formulated.

In next steps, service blue print model was translated into a financial model that was based on cost-based pricing strategy. New pricing model was built with unit as man-days for each equipment, details of which were based on the product portfolio created during workshop. Basic pricing model was prototyped and tested with relevant employees of company XYZ. This helped in clarification of ambiguous items and also eliminating loop holes in new costing model. In addition to this, I also got good feedback about desired user interface of new tool. Instead of designing user interface of new tool based on my own understanding, I was able to translate the users' need in new tool.

Last part of this phase was building a feasibility study by utilizing business model canvas. This acted as a guiding tool for linking the key components of cost estimation model with relevant stake holders, key users and value propositions. It gives a summarized overview of overall business model by explaining working principle and benefits of the model.

#### IV. Execution

Execution of new tool was done in Microsoft excel which was tested with firm's users. After few rounds of testing, new tool was ready to be used by sales support staff for make estimation of site activities costs. This tool serves a key role in overall commercial proposal for marine projects.

One session was conducted for practicing new cost estimation tool with intended users in order to go through the new features and working principles of the new tool. A set of instructions were also created that can help and guide new users.

## 6 Conclusion

This chapter provides wrap-up summary of thesis work, its road map and core values which new cost estimation tool brings for firm's users. In the end, writer has expressed his views on improvement suggestions for future research that can enable cost estimation tool to provide more value for its users.

### 6.1 Summary

In this thesis, service design tools have been utilized in development of cost estimation tool for site service activities in project-based company. Main idea was to develop a general approach using service design methodologies in area of financial modelling that can be utilized in companies other than case study. Developed cost calculation tool has been customized based on needs and product portfolio of case study company XYZ, but the proposed costing strategy and principles can be utilized for creating other cost calculation schemes as well.

Double diamond process proved to be a versatile tool and has helped in addressing the challenges and requirements of user group in making new cost calculation tool. It's four diversified phases covers distinctive aspects of design process. In a nutshell, service design methodology facilitated to involve all key stake holders throughout the process that aided in making new financial tool that addressed the limitations of old cost estimation tool.

### 6.2 Benefits of new cost estimation tool

Key value of new financial tool is its robust algorithm, reduced complexity and clarity in its modular structure. It tends to address major issues and limitations found in old cost estimation tool. Output of financial tool is developed in a way that it is coherent to values given out by the SAP (database storage and processing) system of firm. This enables its users to quickly check output data of costing tool against real cost expenses occurred in similar past projects. This gives a possibility to avoid making false cost estimations for sales projects.

In this tool, special attention is given to simplify cost variables which enable simple and minimum input parameters required from its user. Keeping in view the fact that increase in number of variables tend to elevate the complexity, therefore tool is modelled in a way that it takes limited inputs which are easy, logical and distinguishable.

Intended users of this tool are mostly sales support team members. One of the main requirements of costing tool was to give quick estimations for different project. This tool has built in algorithm for different ship types and gives quick cost estimation for various categories of marine projects.

It is a fact that users tend to feel confident about their results while using a tool, when they completely understand options and infrastructure of tool. User reviews and input has been

mapped throughout the tool's development period which made it possible to have a user interface that is familiar to its users, already when it was in prototype phase. This helps in closing the gaps and ambiguity in understanding of financial tool to its users.

One important aspect of this new cost estimation tool is its flexibility and adaptability to changes. Modular structure is built with the intention that future changes are easy to incorporate and implement in the next versions of this tool. So, if there are new products or site services available, tool can be modified to reflect these changes.

### 6.3 Reflection of research

It must be mentioned here that new cost calculation tool is not full and final version. Financial model of this tool should be taken as framework rather than a permanent solution. It has been made keeping in view current needs and product offerings available in company's portal. In case new features or products are introduced then this model needs to be tested by analytics in order to verify suitability of this tool. As technology and features keep on changing, therefore it is a dire requirement to make customization in financial tool to reflect these changes.

Due to time limitation, I was not able to carry out extensive testing of new cost estimation model in order to find bugs and problems. Also limited amount of feedback was utilized from small group of users. Robustness of this tool can be enhanced by testing it with bigger user groups.

Statistical analysis of tool output data with actual project site cost expenditure, should be done on periodic basis for verification of cost estimation tool. It is important to highlight that update of tool parameters is a continuous process that helps in keeping accuracy of the financial tool with ever-changing market conditions.

### 6.4 Opportunities for further research and development

In this thesis, financial solution is presented which comprises of new cost estimation model. This cost calculation model has been developed for case study keeping in view business segment in which the company is currently working. Nonetheless main idea of this thesis is to develop a general approach and methodology that can be utilized for developing cost estimation tools applicable for other service firms as well. This cost assessment model offers intrinsic framework that can be replicated in other case examples as well.

Most important aspect of this thesis is its modular approach which offers adaptability and flexibility to changes. This gives possibility to use the financial model in changed scenarios and can cater needs of different service-based companies operating in diverse environment.

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## Appendix 1: Interview field guide

Field guide for customer interviews, September to October 2018.

Background: Designation, Role in organization, profession.

List of interview questions asked during the user research phase

User interview:

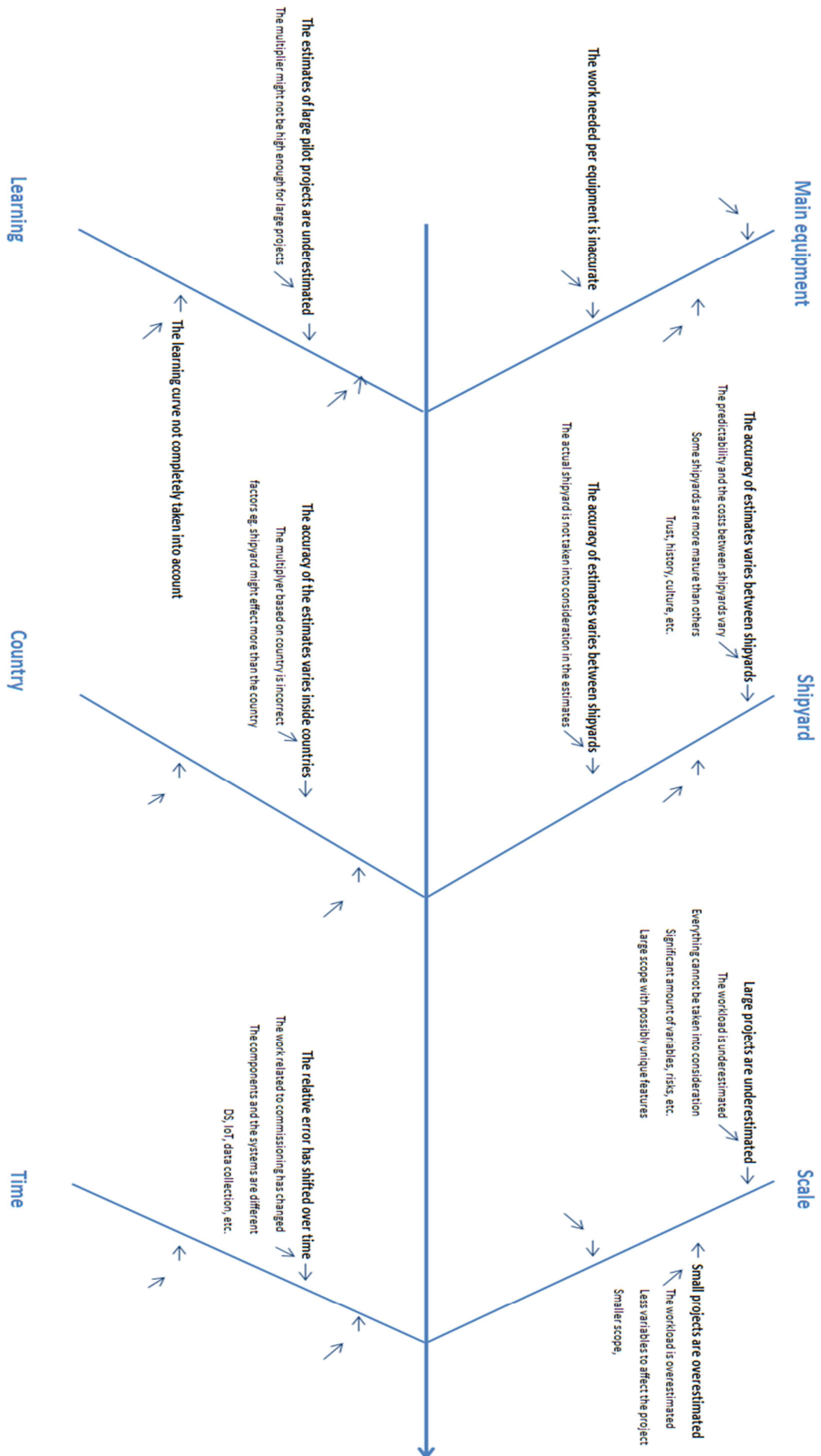
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1. Tell me a little about yourself. Work responsibilities, and technical knowhow?
2. Describe your role in new marine projects?
3. What is the most complex part of project execution?
4. Most marine project demand customization or standard solution caters the need of electric solution?
5. On average how many man days are consumed in inspection, installation, testing and commissioning of equipment for normal marine projects?
6. What are the variable factors that make site activities deviate from normal practices?
7. Which vessel types are challenging?
8. What is the role of shipyard knowledge on installation of company's equipment?
9. Does company utilize own resource for site activities or is it done through third party?
10. Outsourcing site activities from third party have impact on cost structure?

Activity:

- Overview of existing cost estimation tool
  - Feedback about user interface
  - Any additions/removal to be done
  - Improvement suggestion  
(Let the participant see and explain his opinion? what is the idea behind the choices.)
- a. Wrap up
  - b. Did I miss anything?
  - c. Is there anything you want to tell me more?
  - d. Is there anything you want to ask?

Appendix 2: Fish bone diagram





### Appendix 3: Interactive session field guide

Field guide for rapid prototyping, March - April 2019.

Background: Designation, Role in organization, profession.

Briefing about the new tool.

Walk through the tool, explaining user interface, input data and output results

List of questions asked during the interactive session

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1. Tell me a little about yourself and technical knowhow?
2. Which vessel segment do you make proposal for?
3. What is the most challenging item in site activities: sea trial, travelling costs, harbour acceptance tests etc.?
4. How easy is it to select the scope? Detail selection vs brief selection of components?
5. Is there any missing data or information which you would like to see?
6. How is the user interface? Key in items vs drop down list?
7. What kind of summary you would like to see out of the tool?

#### Activity:

- Overview of New cost estimation tool
  - Feedback about user interface
  - Any additions/removal to be done
  - Improvement suggestion
- (Let the participant see and explain his opinion? what is the idea behind the choices.)

1. Wrap up
2. Did I miss anything?
3. Is there anything you want to tell me more?
4. Is there anything you want to ask?

Appendix 4: BMC

