

Planning Production and Control: Design of Experiments (DOE) in Legal Service Industry

¹Wan Mohd Hirwani Wan Hussain, ¹Mohd Nizam Abdul Rahman, ¹Jaharah A. Ghani,

²Wan Kamal Mujani, ³Zinatul Ashiqin Zainol and ⁴Noor Inayah Yaakub

¹Department of Mechanical and Materials Engineering, Faculty of Engineering and Built Environment,

²Department of Arabic Studies and Islamic Civilization, Faculty of Islamic Studies,

³Faculty of Law,

⁴School of Management, Faculty of Economy and Management, University Kebangsaan Malaysia, 43600 Selangor, Malaysia

Abstract: This study discusses the importance applying the design of experiment in legal service industry, as they are in manufacturing industries. While this principle is used frequently in the manufacturing and engineering management literature, surprisingly little has been written about the implementing design of experiments in legal service industry and its important roles. We define the concept and describe how it can be mediate by incorporating customer needs and organizations management. Employing this principle gives an important contribution to the legal practice and sustaining it for future.

Key words: DOE in services, operations management, product planning and control, project management

INTRODUCTION

Service industry has been known as the backbone in developing U.S economy. Many project managers implements design of experiments principles in project management in the services industry to help boost its efficiency and performance. With the increased of the global competition and globalization, most organizations are pressured to become more competitive and advanced. In the legal industry and practice, implementing design of experiment is still new and needs to be developed further. As a service organization, Legal industry can only deliver a service when finished in other investment such as assets, people, place, materials and marketing. Just like in the manufacturing company, legal service also consists of many components and involves many agent in order to deliver the best services for the customer. However, legal service does not involved any physical product but it is a combination of a set of skills that people in legal firms have. Managing and organizing design of experiment in legal services industry require a new set of benchmark that will help strengthening the legal services.

Design of Experiment (DOE) is one of the major parts of the six sigma and nowadays there are many companies adopting the six sigma principles in their organizations. Implementing DOE in the service sector will help the organization identify the way that the person

in that organization works and interactes. The main aim of developing the experiment is to identify the interactions between the factors. In the legal service industry, most of the people are usually aware of the major effect that involved but cannot separate the interactions just like in manufacturing. Another gain of the experiment will help in assessing the performance of the legal service sector compared to manufacturing sector. Design of experiment also helps in solving problem of framework and integrats new dimension and perspective in service industry.

The service system is the fundamental basis to understand value co-creation. (Spohrer and Maglio, 2008) define a service system as a "value co-production configuration of people, technology, other internal and external service systems and shared information". Companies must develop a strategic approach to create service systems that support customer value creation in order to survive in the modern economy (Edvardsson *et al.*, 2005). Creating value in providing services have long been a concept in business research development and also in economics for scholars to identify in order to create value for customer. The importance of the value creation that will help in synchronic with the nature of the business in services while more focused on the organizations that engage with customers that design their service system based on the understanding of individual customer service processes and the resulting unique

customer experience. Another scholar (Normann, 1992) noticed that the need for reframing business to respond to competition, by analyzing new market strategy and customer requirements and to make use of new opportunities by reconfiguring resource constellations to create value in a more effective and efficient way.

Based on the aforesaid paragraph, we try to give an explanation about the importance of the design of experiment in the legal service industry. This study aims to contribute to this debate by exploring how design of experiment principles can be adapted in the legal service industry activities. Legal services and practices are fast growing industry but it are somewhat slow in adapting new technology (Wan Mohd Hirwani *et al.*, 2011)

The research design of this study follows an adductive logic including a theoretical framework and elaborating on it empirically. On the basis of interdisciplinary research literature, we compose a pre-understanding of the role of design of experiment in legal service industry. Then based on the design of experiment literature, we construct our conceptual model of a design of experiment in legal services platform.

LEGAL SERVICES INDUSTRY

Legal service literature includes the studies based on the consumer services and recently also on the business-to-business. As a general principle, providing services differs from physical products in terms of their more abstract nature, parallel production and also consumptions, as well as co-production of the service provider and customer (Normann, 1992). The current legal services literature views that services are more than mere market offerings besides physical products (Edvardsson *et al.*, 2005). Legal service is unique because it is seen as an object of exchange where value is created for the customer through the relationship and interactive communications by the lawyers to their customers. In legal services, this can be done by offering both physical and abstract services to the customers and the knowledge intensiveness provided may vary from complex consulting services to cleaning or catering. Legal services need to be highly customized in order to meet the specific needs of the customer, whereas other services can be offered as standard.

A derived demand is an important element in legal services and the demand that generates from the customer cannot be learnt and understood unless the demand facing business customer is acknowledged (Hutt and Speh, 1994). With increasing expectations and highly specified needs of customers, legal services providers inevitably face the challenges of providing their service development. Besides flexibility, cost efficiency is essential in legal service production and it can be expected to improve together with standardized service production. Implanting design of experiment can be seen as a mean to standardize service production and, thus,

achieve better customer value and profitability. As in the legal service industry that requires the professional standard and integrity in developing the proper design helps in maintaining the relationship with the customer plus also helps in identifying the problem in providing the services for their clients.

Today, there are more than thirteen thousand lawyers and six thousand law firms in Malaysia (Wan Mohd Hirwani *et al.*, 2010). This statistic shows this industry is increasing every year and more than one thousand students graduating from the law schools in Malaysia. There are 5 public universities in Malaysia that offer law degrees in Malaysia which are Universiti Kebangsaan Malaysia (UKM), Universiti Sains Islam Malaysia (USIM), Universiti Utara Malaysia (UUM), Universiti Malaya (UM) and Universiti Darul Iman (UDM). Implementing the design of experiment will help the young lawyers to prepare and embrace with the latest techniques that can help in managing their services. But, it should also born in mind that in Malaysia, lawyers must comply themselves with the rules and regulations such as Malaysia Legal Profession Act 1976, Legal Professional (Practice and Etiquette) Rules 1978, Legal Profession (Publicity Rules 2001). These rule and regulations should be borne in mind when conducting experiment for the clients.

It should be noted that at this point it is interesting to look at one local statement by a prominent lawyer in Malaysia, "With the hope of helping young lawyers implement some effective marketing strategies in their daily lives, the lawyer must find and analyze the various way to reaching out client and serving the further needs of the old ones" Lee (2006). However, such a statement only, with a due respect should be backed by the research or implementations to help the lawyers know about the best strategy that can be utilized for their services. Understanding the design of experiment will help the lawyers to prepare themselves with the latest technology and the best trends that are available in the industry. This will also enhanced the capacity of the lawyer in managing their case and providing better services for their customer.

Design of experiment: The theory in design of experiment was first introduced in agriculture that helped to improve the quantity and quality of the crop yields. However the history of DOE started when (Fisher, 1935) identify the basic problem of the experiment design and deciding what pattern of factors combination that will help to reveal the properties of the response and how can this response influenced by the factors. The use of designed experiments in industry gradually developed in the 1950s with progress both in the West and in Japan. More recently designed experiments have been used in management and the service sector and there have been some major achievements. They are proving to be useful in management and the service sector as they are in manufacturing industries.

This DOE explores the experiments as a simple connecting inputs (factors) and output (responses) and it also can be called as the “black-box experiment design”. The aim of this experiment is to help to select the best combinations that will give information on the input-output performance (Chen and Wang, 2004). There are many previous scholars publishing related to the design of experiment and the reference for this concept have been compiled in three book (Box *et al.*, 1978; Box and Draper, 1987; Atkinson and Donev, 1992).

DOE is important in order to provide the systematic technique that will help to serve this purpose. Using DOE methodology will help to optimize the number of experiments that are required in order to determine the aspect of the various factors that response in the system. DOE involves experiments that are designed to draw inferences about an entire population based on a few well-designed observations. From the computational context, the definition of the experiment refers to the distinct computational that run for a given set of input. However, in the context of actual experiment, the definition of the experiment is the sequence of steps that are taken to ensure that data will be obtained using subsequent analysis of variance (ANOVA) that can be performed to maximize the result and confidence of the analysis. ANOVA is the classical statistical method that can be used to examine and observe the various system factors that happened. Using ANOVA statistical analysis can help lawyers to analyze the factors that contribute to their performance or service and maintain the quality of their services.

In DOE there are three basic principles that are important which are:

- Replication
- Randomization
- Control

These principles are important to analyze the factors that are involved in analyzing the experiment that has been defined. Before beginning collecting the data for the experiment, an experiment is defined to decide how the system is perturbed and where, how and when the experiment will be done and the experiment will observe the phenomena under the investigation (by analyzing the variable involved which is type, location sampling modules etc) (Walter and Pronzato, 1990)

Replication is the first technique in design the experiment and without replication it cannot estimate the error in that experiment and there is no way to identify the effect of the error that are significant. One approach to the analysis of an unreplicated factorial is to assume that certain high-order interactions are negligible and combine their mean squares to estimate the error (Montgomery, 1991). Next analysis is Randomization that are used to help eliminate the bias in experimental units and

treatment of the combinations. This is important to get the best value and get the desired result when performing the analysis. Then, is the Control that refers to the way in which the experimental units that have a particular design have been balanced or grouped together within the experimental units. Particularly important in unlocking the performance optimization puzzle is the introduction of Design of Experiments (DOE) in the “improve” phase (Conklin, 2004). DOE offers a structured approach of assigning statistical significance on potential controls by chopping down variation contributions arising from the various investigated effects (Goh, 2002).

Design researchers have used experiments and observational studies extensively over the last forty years to explore the working practices and performance of designers and design teams (Cross, 2007). Recent examples include (Howard *et al.*, 2010) work on ideation, Dong’s (2005) work on analysing design team communication, Bakeman and Deckner’s (2003) work on behaviour others across a range of areas (Ball and Ormerod, 2000; Robinson *et al.*, 2005). Empirical study forms a valuable part of design research, providing essential insights into many areas of design whilst also supports theory-building (Stempfle and Badke-schaub, 2002) and the development of real world impact as emphasized by (Briggs, 2006; Cross *et al.*, 1996). However, there is an ongoing challenge to improve the quality of empirical studies in design research (Meyer and de Tore, 1999).

SIX SIGMA IN LEGAL SERVICES

As one of the major part in Six Sigma, it is very important to also look the six sigma principle and methodology. As it applies to most manufacturing industries (Antony, 2004; Wan Mohd Hirwani *et al.*, 2011) the history of the six sigma first started in Motorola (Pande *et al.*, 2000), General Electric (Snee and Hoerl, 2003) or Polaroid (Harry and Schroeder, 2000). There are a number of growing publication of the six sigma principles in services industry during the past years. This is the fact that it not only emphasized from the empirical studies (Antony, 2004; Process Lab and Celerant, 2008). There are also a number of publications related to the application of the Six Sigma from the perspective of the service providers (Breyfogle *et al.*, 2001; Hensley and Dobie, 2005). It should be noted here that services processes differ fundamentally from production processes (Hensley and Dobie, 2005). If Six Sigma are applied in services industry especially the legal services, the impacts of this have to be anticipated. This have been mentioned by (Johannsen and Leist, 2009) that describes the characteristic of the services processes as well as production processes that result from the Six Sigma application.

In the service industry, the most important criteria are to approach zero defects by measuring the customer satisfaction. In dealing with the customer, it is difficult to measure the customer satisfaction because it also involve dealing with the feeling and environment unlike the manufacturing industry. From the legal perspective, the lawyer should always measure the performance of their services and compared themselves to other profession. Adopting design of experiment will embrace the lawyers with the new paradigm and perspectives in managing quality and services.

Based on the aforesaid paragraphs, implementing Six Sigma principles in legal services is important because the nature of the work of the lawyer themselves which requires fulfilling customer satisfaction. Lawyers are service professionals who give professional advice and maintain their professionalism. By replicating the Six Sigma principle we feel that this will improve the image of Malaysian lawyers and at the same time improve the productivity. Implementing Six Sigma principle will also help Malaysia lawyers to create good relationship with the client and ensure business success in the future. Servic_oriented businesses adopting Six Sigma business strategy will reap benefits (Fitzsimmons and Fitzsimmons, 2004)

Antony (2005) mentioned the benefits of applying the Six Sigma principle based on a survey, as follows:

- Improved customer satisfaction
- Reduced defect rate in service processes
- Reduced variability of key service processes
- Improved culture with the attitude of continuous Improvement of service process performance
- Reduced process cycle time and hence achieve faster service delivery
- Reduced service operational costs
- Increased market share

The writers found that the potential and impact of the Six Sigma principle to the service industry are abundant. However, the question that arises here whether this is the case with legal services especially in the Malaysian environment. The answer here remains a mystery and there should be more detailed research done to provide more understanding in applying the Six Sigma to the Malaysia legal services.

The methodology used in this article is examining previous research related to the implementation of Six Sigma principle in services. The law profession is slow to adapt to a new environment and until today there are still law firms that use typewriters rather than computers in Malaysia. The adoption of new techniques and skills takes time and determination to change. There is a lack of resources and information that can help to implement the Six Sigma for services especially for Malaysian lawyers. Using this approach and mechanism will help to develop

an in-depth, relevant understanding of poorly understood phenomenon (Eisenhardt, 1989; Meredith, 1998; Yin, 1994).

FUTURE RESEARCH

This study involved analyzing the previous research and implementing the design of experiment principles in legal services and practice industry. We find that there should be more research done to analyze the mechanism and technique in applying design of experiment for lawyer service and practice. There are new approach called Service-Dominant Logic (SDL) that suggested by (Vargo and Lusch, 2004; Heizer and Render, 2004) to understand the value of providing better service. It helps to understand the market conditions and also provide better service for the client. This also can be used as a new research perspective to understand and analyze how it will give impact to the legal service in Malaysia. Much prior theoretical work has implicitly assumed that SDL has advantages when it comes to understanding value creation. However, this has not been empirically demonstrated.

CONCLUSION

Legal industry is one of the service sector that can adopt Designed experiments. It can be useful in management and the service sector, as they are in manufacturing industries. Designed Experiments (DOE) forms a major part of six sigma projects and as more and more diverse companies are adopting six sigma, we can expect to see more examples of their use. The use of DoE in the service sector highlights the importance of certain aspects of the methodology. Factor levels often involve changing the way people work and so have to be handled carefully. It is even more important to get everyone working as a team. Trials are often separated by time and so careful randomization is important to avoid time effects. There is no bar to using more complicated designs if the research ideas justify them. The main gain of experiments is to identify interactions between factors. People are usually aware of major factor effects but cannot separate interactions so easily. Another gain from the experiment is assessing the size of the effect of a factor. It may be known that the factor is significant but not the extent of its impact in financial and other terms. Quantitative assessment of intervention is fundamental to six sigma projects. Designed experiments fall within the problem solving framework and as such, it is important to look at the knock on effects of any changes implied by the results of the experiment. In service applications, it is particularly important to give clear output from the experiment and outcomes should be presented in graphical and creative ways.

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