

Customer Satisfaction Feedback in an IT Outsourcing Company: A Case Study on the Insignia Hengtian Company

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ABSTRACT

To reduce budget and improve competitive power, some companies would outsource their information technology (IT) functions to a third-party company referred to as an IT outsourcing company. After an outsourcing company completes a project, it would collect feedback from the customer. Analyzing this feedback could help to further improve the service of the outsourcing company. To our best knowledge, there are limited studies on customer satisfaction feedback.

In this paper, we perform a case study of customer satisfaction feedback in an IT outsourcing company. We analyze 3 years of customer satisfaction feedback reports in Insignia Hengtian, which is the one of the well-known IT outsourcing companies in China with more than 2,000 employees. Each report specifies the overall satisfaction of a customer, and feedback on factors that contribute to customer satisfaction including: business knowledge and technical skills, work attitude, communication skills, on-time delivery, cost-effectiveness, etc. In total, we investigate 8 factors which are related to customer satisfaction. Next, we build a logistic regression model and analyze the statistical significance and collinearity characteristics of the independent factors used to build the model. We find that among the 8 factors, business knowledge and technical skills, on-time delivery, and cost-effectiveness are the 3 most important factors, and all of them have positive impact to customer satisfaction.

Categories and Subject Descriptors

D.2.6 [Software Engineering]: Metrics

General Terms

Measurement, Experimentation

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Keywords

Customer Satisfaction Feedback, IT Outsourcing, Logistic Regression, Collinearity, Case Study

1. INTRODUCTION

To reduce and control operating costs, improve company focus, free internal resources for other purposes, and improve competitive power, many companies subcontract a part or all of their information technology (IT) functions to an external outsourcing vendor [1]. *IT outsourcing* has been a pervasive trend around the world. A previous study has shown that the budget spent on IT outsourcing has increased from \$2.5 billion to \$10 billion from 1998 to 2003 [2]. There are many well-known IT outsourcing companies such as Accenture and IBM.

A typical IT outsourcing company has a number of customers, and these customers would request different projects¹ to the IT outsourcing company. If a customer is not satisfied with services provided by an IT outsourcing company, it would engage the service of another IT outsourcing company. Thus, it is important for an IT outsourcing company to keep their customers satisfied.

To gauge the satisfaction level of customers, once a project is completed, some IT outsourcing companies like Insignia Hengtian² in China would perform a survey to collect satisfaction feedback information from the customer. Analyzing this feedback could help to improve the quality of service of an IT outsourcing company. There are many factors that potentially affect customer satisfaction, such as business knowledge and technical skills, work attitude, and on-time delivery. Identifying the most important factors related to customer satisfaction could help the company to improve its service and highlight areas where they need to focus their effort on.

Despite the importance of understanding customer satisfaction, unfortunately, to our best knowledge, there are limited studies on customer satisfaction in an IT outsourcing company. To fill this gap, in this paper, we perform a case study on customer satisfaction in Insignia Hengtian. Insignia Hengtian is one of the well-known IT outsourcing companies in China which has more than 2,000 employees. We first collect customer satisfaction feedback reports from 2011 to 2013 and investigate eight factors that may contribute to customer satisfaction. Each of this report specifies the customer overall satisfaction and feedback on various quality factors. In total, we analyze 95 customer satisfaction feedback re-

¹In this paper, we use projects, IT functions, and services interchangeably.

²www.hengtiansoft.com/

Part 1 Overall

1. How would you rate our products and services? ()
A. Satisfied B. Unsatisfied

Part 2 Product and Service

1. How would you rate the performance of our resources?
 - ⊕ Business Knowledge and Technical Skills: ()
A. Excellent B. Good C. Average D. Below Average
 - ⊕ Work Attitude: ()
A. Excellent B. Good C. Average D. Below Average
 - ⊕ Communication Quality: ()
A. Excellent B. Good C. Average D. Below Average
2. How would you rate our management of resources?
 - ⊕ Communication and People Caring: ()
A. Excellent B. Good C. Average D. Below Average
 - ⊕ Training and Career Development: ()
A. Excellent B. Good C. Average D. Below Average
 - ⊕ On-time Delivery: ()
A. Excellent B. Good C. Average D. Below Average
3. How would you rate the following aspects, when considering the cost-effectiveness of our services?
A. Excellent B. Good C. Average D. Below Average
4. How would you rate our personnel's behaviors when considering the observation of your company's information security related policies, rules, procedures, standards, etc. (if applicable)? (e.g., safeguarding client's confidential or proprietary information, using client's information technology assets, observing network access policy, etc.) ()
 - ⊕ A. Excellent B. Good C. Average D. Below Average

Part 3 Further Cooperation

1. Are there any aspects of our services that excel and make us stand out?
2. Which aspects do you think we can improve to satisfy your company's demands better? Ex. on-time support, response time, project management process, business knowledge, etc.

Figure 1: Parts of the survey to obtain customer satisfaction feedback.

ports from 95 projects completed in the 3 years. Next, we adapt the statistical approach used by Cataldo et al. [3] and Shihab et al. [4] to identify statistically significant and minimally collinear factors (i.e., independent variables in a logistic regression model) which impact customer satisfaction. We find that among the 8 factors, business knowledge and technical skills, on-time delivery, and cost-effectiveness are the 3 most important factors, and all of them have positive impact to customer satisfaction.

The main contributions of this paper are:

- To our best knowledge, we are the first to investigate factors that impact customer satisfaction in an IT outsourcing company. We analyze 3 years of customer satisfaction feedback reports received by Insigma Hengtian.
- We find that business knowledge and technical skills, on-time delivery, and cost-effectiveness are the 3 most important factors that impact customer satisfaction.

Paper organization. The remainder of the paper is organized as follows. We present our case study setup in Section 2. We present our case study results in Section 3. We discuss the threats to validity in Section 4. We discuss related work in Section 5. We conclude and mention future work in Section 6.

2. CASE STUDY SETUP

In this section, we first present our data collection process in Section 2.1. Next, we describe the quality factors that we study in Section 2.2. Finally, we present our approach to identify the most important factors to customer satisfaction 2.3.

2.1 Data Collection

To perform our case study, we first collect customer satisfaction feedback reports. In Insigma Hengtian, after a project is completed, Insigma Hengtian would send out a survey to the customer to ask for their feedback about the project. We collect customer satisfaction feedback reports from 2011 to 2013, and there are 109 reports which correspond to 109 closed projects during the 3 years. Since some reports are incomplete (e.g., the customer does not give answers to some of the questions in the survey), we remove these reports, and in total, we have 95 completed reports.

Figure 1 presents a part of the customer satisfaction feedback survey. The survey contains 3 sections: overall, product and service, and further cooperation. In the overall section, the customer would indicate whether they are satisfied with the project completed by Insigma Hengtian. In the product and service section, Insigma Hengtian asks different questions to the customers, and each question corresponds to a factor that we would like to investigate in this paper. For each factor, the customers are asked to choose one of the four choices: excellent, good, average, and below average. We assign the scores of 4, 3, 2, and 1 to the four choices, i.e., excellent, good, average, and below average, respectively In the further co-

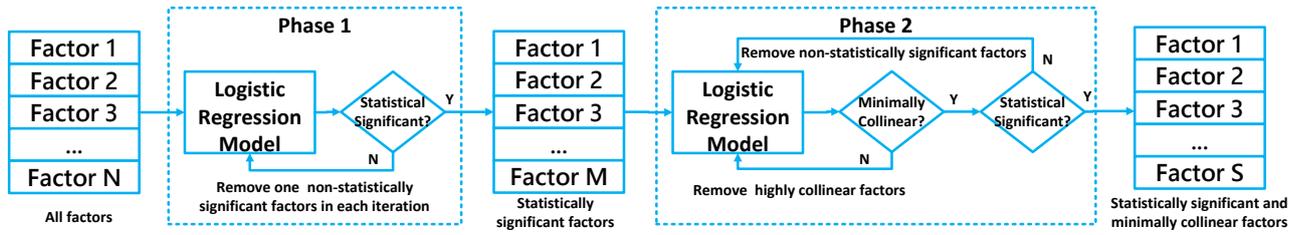


Figure 2: Proposed approach: Identification of most important factors

operation section, Insigma Hengtian asks for free-form comments about aspects of the service that the customer find excellent, and aspects that could be improved.

2.2 Studied Factors

We consider 8 factors grouped into four dimensions: performance, management, cost-effectiveness, and personnel’s behaviors.

2.2.1 Performance Dimension

The performance of developers would affect customer satisfaction. The performance of developers can be measured by a number of factors, for example, technical skill, work attitude, and communication quality. In general, if the technical skill of developers is strong, the work attitude is good, and the communication quality is high, the customer is likely to have a high rate of satisfaction. Thus, in the performance dimension, we analyze 3 factors: business knowledge and technical skills, work attitude, and communication quality.

2.2.2 Management Dimension

Management (including people management and project management) is also important to customer satisfaction. A poorly managed project team or company would cause low customer satisfaction. Intuitively, if an IT outsourcing company has a good training and career development program, communicate well to and care about their employees, the employees are likely to have high enthusiasm to complete the projects, which contribute to high customer satisfaction. Furthermore, on-time delivery is very important to customers; a project team which strictly follows the development plan, and delivers the product on time, will contribute to high customer satisfaction. Thus, in the management dimension, we mainly analyze 3 factors: communication and people caring, training and career development, and on-time delivery.

2.2.3 Cost-effectiveness Dimension

Cost is an important factor that customers would consider. Although a company project delivery is good, if the cost is too high, customers are less likely to continue requesting for more projects in the future. Also, with higher cost, customers are likely to expect higher quality; on the other hand, with lower cost, customers are likely to tolerate lower quality. Thus, cost-effectiveness which measures the trade-off between cost and quality, is an important factor that impacts customer satisfaction. In general, high cost-effectiveness is likely to result in high customer satisfaction.

2.2.4 Personnel’s Behaviors Dimension

Personnel’s behaviors such as whether they obey the security policies in a company are also an important factor. Some customers have high security requirements, e.g., developers cannot copy data between two machines, or other employees who are not in the project team cannot access the project’s data. If a customer perceives that the employees of an IT outsourcing company frequently

disobey the security policy, the customer is likely to have low satisfaction.

2.3 Proposed Approach

Figure 2 presents the process that we follow to identify the most important factors. Our approach is inspired by the statistical approaches followed by the previous studies of Cataldo et al. [3] and Shihab et al. [4]. In a nutshell, our approach takes as input a set of all of the 8 factors that we present in the previous section, and outputs a final set of selected factors after two phases.

In the first phase, we build a logistic regression model, and analyze the statistical significance of the independent variables (in our case: factors) in the model. We iterate the above process multiple times, and each time, we remove the weakest factor (i.e., the factor which has the highest p-value). The process ends when we have a model that only contains statistically significant factors. Next, in the second phase, we build a logistic regression model based on the statistically significant factors, and analyze their collinearity characteristics. We eliminate the highly collinear independent factors. We also recheck for statistical significance since the statistical significance of an independent variable may differ for different models trained using different sets of independent variables. The output of our approach is a set of factors which are statistically significant and minimally collinear.

2.3.1 Logistic Regression Model

A logistic regression model computes correlations between independent variables and a discrete dependent variable [5]. In our study, the independent variables are the 8 quality factors, and the dependent variable is a binary variable that represents whether or not a customer is satisfied with the service that an IT outsourcing company provides. We use SPSS Statistics³ to build a multivariate logistic regression model. SPSS Statistics is a popular software package used for statistical analysis.

2.3.2 Statistical Significance Analysis

We perform a statistical analysis using SPSS to study the statistical significance of each independent variable (i.e., factors) in a logistic regression model. SPSS computes p-value which determines statistical significance. We remove factors with p-value greater than a specified threshold value. In our paper, following [4], we set the threshold as 0.1, i.e., if $p\text{-value} < 0.1$, then it is statistically significant.

2.3.3 Collinearity Analysis

Collinearity is a statistical phenomenon in which two or more independent variables are highly correlated [6]. Collinearity makes it difficult to determine the independent variables (i.e., factors) that actually impact the dependent variable (i.e., customer satisfaction). Also, collinearity causes higher standard error. Thus, minimizing

³<http://www-01.ibm.com/software/analytics/spss/>

Table 1: Average scores given by satisfied and dissatisfied customers.

Factors	Satisfied	Dissatisfied
Business Knowl. and Techn. Skills	2.43	1.84
Work Attitude	2.93	2.37
Communication Quality	2.68	1.91
Communication and People Caring	2.61	1.82
Training and Career Development	2.29	1.37
On-time Delivery	2.68	1.70
Cost-effectiveness	2.50	1.34
Personnel's Behaviors	1.68	1.19
Average.	2.48	1.70

Table 3: Detailed outputs to get the statistically significant and minimally collinear factors in the second phase.

Selected Factors in the First Iteration	P-value	VIF
Business Knowledge and Technical Skills	0.0222*	1.6110
On-time Delivery	0.0011**	2.3981
Cost-effectiveness	0.0043**	1.9761

(P-value < 0.01 **; P-value < 0.1 *)

collinearity among the independent variables of the logistic regression model could help to identify the most important factors. To measure the level of collinearity, we compute *tolerance* and *variance inflation factor* (VIF) using SPSS. The VIF value is the reciprocal of the tolerance value. A tolerance value close to 1 means that there is low or little collinearity, while a tolerance value close to 0 indicates high collinearity. Following the previous studies [3,4], we set the maximum VIF scores as 2.5, i.e., we remove factors whose VIF scores are larger than 2.5.

3. CASE STUDY RESULTS

In this section, we present the results for our case study. We first present the average scores that customers give to each factor when they are satisfied or unsatisfied with a project in Section 3.1. Next, we present the detailed outputs of our proposed approach in Section 3.2. Finally, we analyze the impact of the selected factors in Section 3.3.

3.1 Average Scores

Table 1 presents the average scores that customers give to projects when they are satisfied and dissatisfied. We notice that across the 8 factors, the average scores for satisfied and dissatisfied customers are 2.48 and 1.70 respectively, i.e., customers who are satisfied often give a score between average and good, while dissatisfied customers often give a score between below average and average.

Across the 8 factors, the average scores for satisfied and dissatisfied customers are different indicating that the factors may have impact on customer satisfaction.

3.2 Detail Outputs of Our Proposed Approach

In our proposed approach, we have two phases. The goal of the first phase is to get the statistically significant factors, and the goal of the second phase is to get the statistically significant and minimally collinear factors. Table 2 and 3 present the detail outputs of our proposed approach in the first and second phase respectively.

From Table 2, we have 6 iterations, and in each iteration, we eliminate one factor from the set of factors which has the largest

Table 4: Odds ratios of the selected factors.

Factors	Odds Ratios
Business Knowledge and Technical Skills	10.3044*
On-time Delivery	10.8216**
Cost-effectiveness	6.9429**

(P-value < 0.01 **; P-value < 0.1 *)

p-value. The elimination sequence is training and career development, communication and people caring, communication quality, work attitude, and personnel's behaviors. After the 6 iterations, the remaining factors all have p-values less than 0.1, and on-time delivery and cost-effectiveness both have p-values less than 0.01. In the second phase, we compute the VIF values of the selected factors. From Table 3, we notice that the VIF values for business knowledge and technical skills, on-time delivery, and cost-effectiveness are 1.6110, 2.3981, 1.9761, respectively. Since the VIF values of the 3 selected factors are less than 2.5, and their p-values are also less than 0.1, there is no need for extra iterations.

Business knowledge and technical skills, on-time delivery, and cost-effectiveness are the 3 most important factors which are statistical significant and minimally collinear.

3.3 Impact of Selected Factors

We would like to quantify the impact of the selected factors on customer satisfaction. We build a logistic regression model based on the 3 selected factors, and we use odds ratio to quantify impact. Odds ratio is the exponent of the logistic regression coefficients. Odds ratio greater than 1 indicates that there is a positive correlation between the factor and customer satisfaction (i.e., an increase in a factor is likely to cause an increase in the satisfaction of a customer), while odds ratio less than 1 indicates a negative correlation (i.e., an increase in a factor is likely to cause a decrease in the satisfaction of a customer).

Table 4 presents the odds ratios of the 3 selected factors. The odds ratios for business knowledge and technical skills, on-time delivery, and cost-effectiveness are 10.3044, 10.8216, and 6.9429, respectively. Since all of them are greater than 1, they have positive impact on customer satisfaction. The odds of a customer to be satisfied is increased by 10.3044, 10.8216, and 6.9429 times, when there is a unit increase in the business knowledge and technical skills, on-time delivery, and cost effectiveness score respectively.

Business knowledge and technical skills, on-time delivery, and cost-effectiveness, have strong positive impact on customer satisfaction. The odds of a customer to be satisfied is increased by at least 6 folds when there is a unit increase in business knowledge and technical skills, on-time delivery, and cost effectiveness.

4. THREATS TO VALIDITY

Threats to internal validity refers to errors in our code and case study. We have double checked our code and also the customer satisfaction feedback reports, however, there may exist some errors that we did not notice.

Threats to external validity relates to the generalizability of our results. We have analyzed 95 customer satisfaction feedback reports which correspond to 95 completed projects in Insigma Heng-tian for 3 years. In the future, we plan to reduce this threat further by analyzing even more customer satisfaction feedback reports from more IT outsourcing companies.

Table 2: Detailed outputs (i.e., p-values of factors for various iterations) to get the statistically significant factors in the first phase.

Factors	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6
Business Knowledge and Technical Skills	0.0679*	0.0469*	0.0372*	0.0337*	0.0322*	0.0222*
Work Attitude	0.5242	0.5275	0.5224	0.4012**	-	-
Communication Quality	0.6332	0.6381	0.6426	-	-	-
Communication and People Caring	0.8534	0.8920	-	-	-	-
Training and Career Development	0.8888	-	-	-	-	-
On-time Delivery	0.0590*	0.0419*	0.0097**	0.0027**	0.0010**	0.0011**
Cost-effectiveness	0.0061**	0.0056*	0.0056**	0.0046	0.0016**	0.0043**
Personnel's Behaviors	0.1731	0.1721	0.1735	0.1940	0.1927	-

(P-value < 0.01 **: P-value < 0.1 *)

Threats to construct validity refers to the suitability of our proposed statistical approach. Our approach is based on the statistical approaches used in previous studies, e.g., [3, 4]. Thus, we believe there is little threat to construct validity.

5. RELATED WORK

There have been a number of studies on IT outsourcing [1, 2, 7]. Altinkemer et al. investigate the benefits as well as risks of IT outsourcing and characterize the perceived value of IT outsourcing by investigating the annual reports of 31 IT outsourcing companies [1]. Global insight company studies the impact of offshore IT software and services outsourcing on the US economy and IT industry [2]. Weakland and Brian investigate various aspects of IT outsourcing companies, such as the trends of IT outsourcing, and the risks of IT outsourcing [7]. Our work is orthogonal to the above studies; we investigate important factors that impact customer satisfaction by analyzing customer feedback forms, which is a different problem.

Shenhar et al. characterize project success into several dimensions: project efficiency, impact on customer, business success, and preparing for the future [8]. DeLone and McLean model project success by stressing on the net benefits that a project gives to project stakeholders [9]. In their model, net benefit is affected by a number of factors including usage of an information system built by the project, user satisfaction, system quality and information quality. Xia et al. perform an industrial study on software internationalization and localization in a famous bank [10]. In this study, we analyze factors that affect the success of an IT outsourcing company measured by customer satisfaction.

6. CONCLUSION AND FUTURE WORK

In this paper, we perform a case study on customer satisfaction in an IT outsourcing company. We analyze 3 years of customer satisfaction feedback reports in Insigma Hengtian, a well-known IT outsourcing company in China. We investigate the impact of 8 different factors to customer satisfaction, such as business knowledge and technical skills, work attitude, and on-time delivery. To identify the most important factors, we build a logistic regression model and analyze the statistical significance and collinearity characteristics of the independent factors used to build the model. We find that among the 8 factors, business knowledge and technical skills, on-time delivery, and cost-effectiveness are the 3 most important factors, and all of them have strong positive impact to customer satisfaction.

In the future, it would be interesting to investigate more factors which might impact customer satisfaction. It is also interesting to investigate more customer satisfaction feedback reports from more IT outsourcing companies.

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7. REFERENCES

- [1] K. Altinkemer, A. Chaturvedi, and R. Gulati, "Information systems outsourcing: Issues and evidence," *International Journal of Information Management*, vol. 14, no. 4, pp. 252–268, 1994.
- [2] G. Insight, "The comprehensive impact of offshore it software and services outsourcing on the us economy and the it industry," *Lexington, MA, March*, 2004.
- [3] M. Cataldo, A. Mockus, J. A. Roberts, and J. D. Herbsleb, "Software dependencies, work dependencies, and their impact on failures," *Software Engineering, IEEE Transactions on*, vol. 35, no. 6, pp. 864–878, 2009.
- [4] E. Shihab, Z. M. Jiang, W. M. Ibrahim, B. Adams, and A. E. Hassan, "Understanding the impact of code and process metrics on post-release defects: a case study on the eclipse project," in *Proceedings of the 2010 ACM-IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)*. ACM, 2010.
- [5] J. Neter, M. H. Kutner, C. J. Nachtsheim, and W. Wasserman, *Applied linear statistical models*. Irwin Chicago, 1996, vol. 4.
- [6] D. E. Farrar and R. R. Glauber, "Multicollinearity in regression analysis: the problem revisited," *The Review of Economic and Statistics*, pp. 92–107, 1967.
- [7] T. Weakland and B. Tumpowsky, "Global it outsourcing study," *DiamondCluster International, Inc.*, <http://diamondcluster.com/Ideas/Viewpoint/PDF/DiamondCluster2005OutsourcingStudy.pdf>, 2005.
- [8] D. D. L. O. Shenhar, A.J. and A. Maltz, "Project success: A multidimensional strategic concept," *Long Range Planning*, 2001.
- [9] W. DeLone and E. McLean, "The delone and mclean model of information systems success: A ten-year update," *Journal of Management Information Systems*, 2003.
- [10] X. Xia, D. Lo, F. Zhu, X. Wang, and B. Zhou, "Software internationalization and localization: An industrial experience," in *Engineering of Complex Computer Systems (ICECCS), 2013 18th International Conference on*. IEEE, 2013, pp. 222–231.