

# The Service Marketing Analysis by Using Six Sigma Management Approach

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## Abstract

In this research, the approach of Six Sigma management will be used to define the requirement and the demand of service marketing. The relevant performances including number of order, product categories, number of new customers, number of customers, days of zero order for the service unit and sales performance will be measured. The key causes which affect the performance of the service marketing can be analyzed. The improvement and control actions of service marketing can be further recommended and implemented. The service quality can be also obtained and the effect of service quality on sales will be evaluated. The training system and standard operation procedures to improve and control the sales can be then established.

**Keywords:** six sigma, DMAIC, performance, service marketing, sales

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## 1. INTRODUCTION

Parasuraman *et al.* (1985, 1994) and Zeithaml *et al.* (1996) presented the service quality and the measurement of service quality and the impact on customer retention. Zeithaml *et al.* (1985) described that the service was intangible and the strategy was required for service marketing. Lewis and Booms (1983) considered the marketing aspects related to service quality. Wilson *et al.* (2008) presented that the service was significant for retaining the customers in the service marketing. The concept of service marketing about service process, service performance, and service orientation in marketing were studied (Barton *et al.*, 2003; Gronroos, 1982, Gronroos, 2007; Lovelock, 1999; Lovelock *et al.*, 2008; Rust *et al.*, 1996). Gummesson (2007) mentioned the behavior of customers could be affected by the service marketing. Zeithaml *et al.* (2006) emphasized the integration of the service marketing and customer focus. Kwortnik and Thompson (2009) studied the service innovation and service experience in service marketing. The service dominant logic could create the value of service and affect the collaboration and consumption behavior instead of product focus (Brodie, 2009; Gronroos, 2006; Gronroos and Ravald, 2011; Vargo, 2009; Vargo and Lusch, 2008). In this paper, the approach of Six sigma management will be used to analyze the performance in service marketing.

McFadden (1993) presented that Six sigma management constructed the improvement methods of the customer oriented quality management. Harry (2000) presented that Six sigma management was to combine total quality management and financial results. Chakravorty (2009) presented an implementation model in Six sigma management for network technology company.

General Electric has continuously reduced the variation to gain the benefit successfully since 1995 (Henderson and Evans, 2000; Hendricks and Kelbaugh, 1998). Ford Motor integrated Six sigma management with quality management system (QS-9000) to reach quality objectives (Munro, 2000). Klefsjo *et al.* (2001) emphasized the value of managerial performance and could result in the improvement of cost and benefit of the projects (Lee, 2008). The organizational culture can be linked with Six sigma management (Zu *et al.*, 2010). Swink and Jacobs (2012) showed that Six sigma management could be integrated with operation management to achieve the successful performance.

George (2002) presented that DMAIC can be an approach to make much improvement in performance, benefit, and efficiency (Lee, 2009, 2013). In the define phase, the voice of customers should be evaluated to define the objective and scope of mission, and then the proper project can be selected. The team charter can be also confirmed to include the right people. The right support from the high level managers is also required. In the measure phase, the data collection for scientific analysis is needed and can be based upon the voice of customers. The gap analysis of performance between the customers and the company can be followed to get the critical processes. In the analyze phase, the statistical method can be used to find the root causes and effect. The vital few factors which can affect the output or the customers' need can be obtained. In the improve phase, the actions of improvement can be taken to reduce the defects and variation so that the customer satisfaction

or the objectives can be enhanced. The preventive actions should be also taken by specifying the tolerance of the critical factors and correct the nonconforming processes. In the control phase, the control methods or control chart can be used to control critical input variables and then monitor the critical output variables in order to maintain the effectiveness of the breakthrough improvement.

## 2. NORMAL THE SERVICE MARKETING ANALYSIS BY USING SIX SIGMA MANAGEMENT APPROACH

This company is to assemble and sale the automobile auxiliary parts to supply the need of customers. The sales are the critical issue instead of productivity improvement. In this practical case, the DMAIC (define, measure, analyze, improve, and control) approach of Six sigma management will be used to improve the sales of service market. The relevant methods can be illustrated as the following.

(1) Define: In the define phase, the voice of customers should be evaluated to define the objective and scope of mission, and then the proper project can be selected. The team charter can be also confirmed to include the right people. The right support from the high level managers is also required. The cause and effect analysis can be used to consider the feasibility analysis for sales project and productivity project. The cause can include sales project and productivity project. The effect can cover cost/benefit, technology, customer satisfaction, employee satisfaction, and time.

According to the feasibility analysis on Table 1., the sales project will be the priority to be improved based upon the aspects of cot/ benefit, technology, customer satisfaction, employee satisfaction, and time due to high benefit and satisfaction of customer and employee in sales project. The cross function team is then set up to improve the sales objective.

(2) Measure: In the measure phase, the data collection for scientific analysis is needed and can be based upon the voice of customers. The gap analysis of performance between the customers and the company can be followed to get the critical processes.

The data which may affect the sales is decided after brain storming, and can include number of order, product categories, number of new customers, number of customers, days of zero order for the service unit and sales performance on Table 2. The service quality for respective service unit can be obtained.

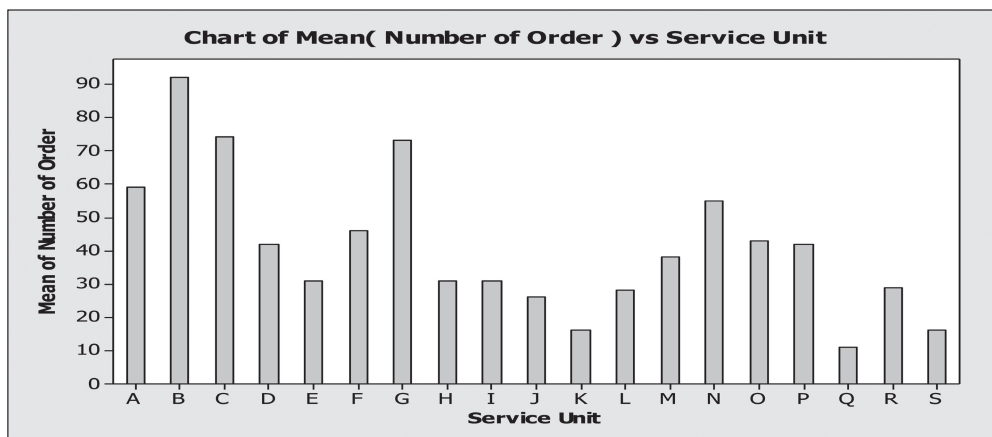
**Table 1. Feasibility analysis of projects**

Projects	Cost/ benefit	Technology	Customer satisfaction	Employee satisfaction	Time
Sales project	5	3	5	5	3
Productivity project	2	4	4	3	3

**Table 2. Sales performance**

Monthly Report							
Service Unit	Number of order	Product categories	Number of new customers	Number of customers	Days of zero order	Service Quality	Sales (thousands)
A	59	67	0	40	0	60.64	304
B	92	92	4	61	0	83.48	266
C	74	74	3	55	0	73.05	171
D	42	53	0	35	0	52.35	207
E	31	50	2	24	0	46.91	224
F	46	43	1	37	2	44.74	204
G	73	71	2	53	0	70.74	165
H	31	56	0	21	4	29.46	201
I	31	36	4	24	3	33.67	208
J	26	32	1	19	0	39.67	71
K	16	21	1	12	4	16.77	89
L	28	101	2	23	4	39.99	157
M	38	28	8	30	2	42.87	104
N	55	46	2	36	2	47.69	150
O	43	42	18	33	2	55.51	100
P	42	45	15	33	1	57.58	175
Q	11	15	5	8	5	12.12	10
R	29	34	26	26	3	50.49	83
S	16	19	0	10	0	30.88	183
Total	783	925	94	580	32	--	3,072

From Figure 1, the service unit B, C, and G perform well in the number of order and show the strong intention to get the customer order.

**Figure 1. Number of order**

From Figure 2, the service unit R, O, and P perform well in the number of new customers and try to explore the new market to obtain new customers.

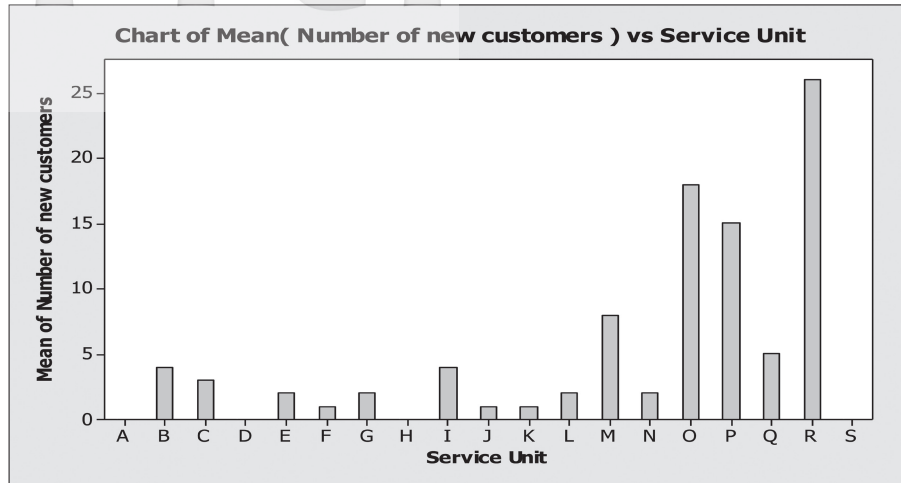


Figure 2. Number of new customers

From Figure 3, the service unit A and B perform well in sales and show the contribution in financial result.

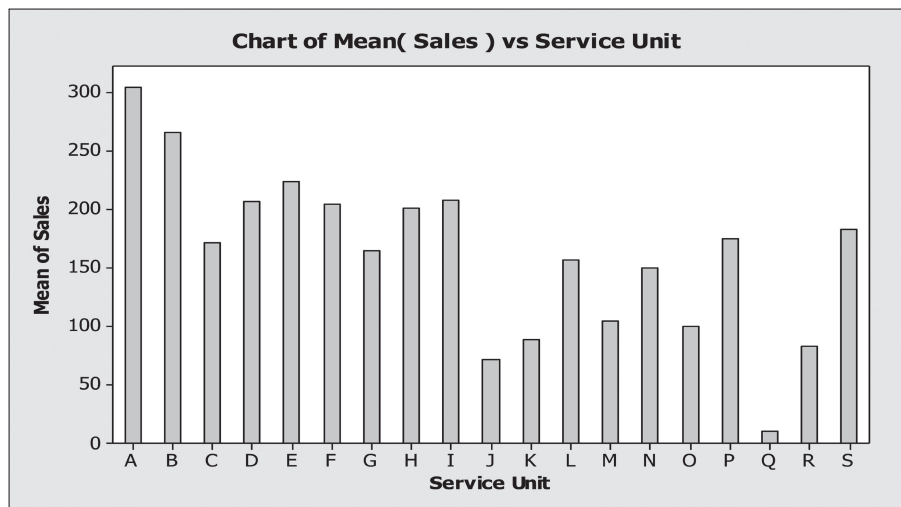
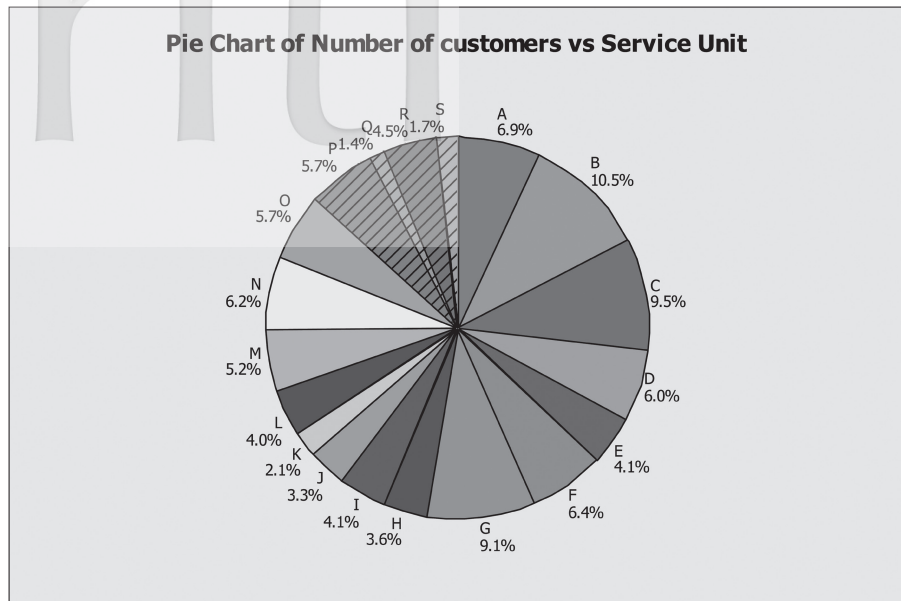


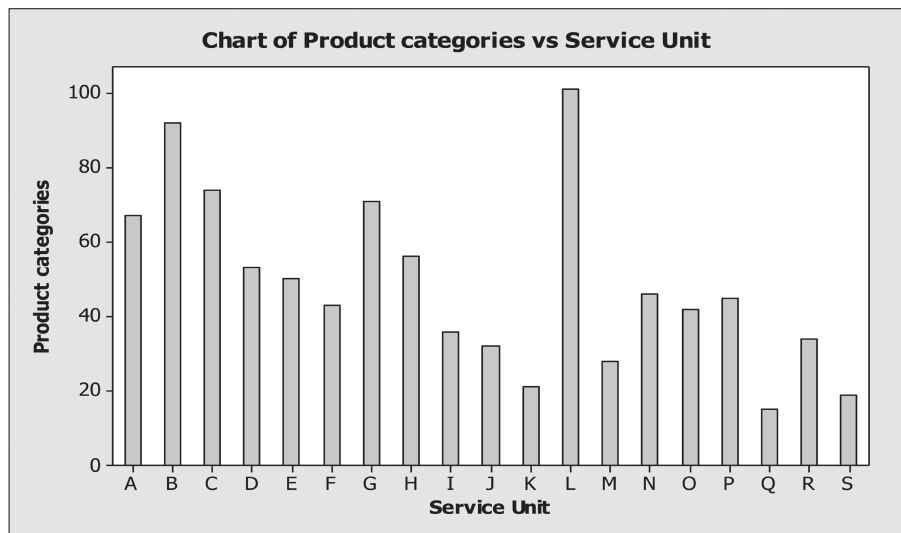
Figure 3. Sales

From Figure 4, the service unit B, C, and G perform well in the number of customers and keep the loyalty from the customers.



**Figure 4. Number of customers**

From Figure 5, the service unit B and L perform well in product categories and sell a variety of products to the customers within the product scope.



**Figure 5. Product categories**

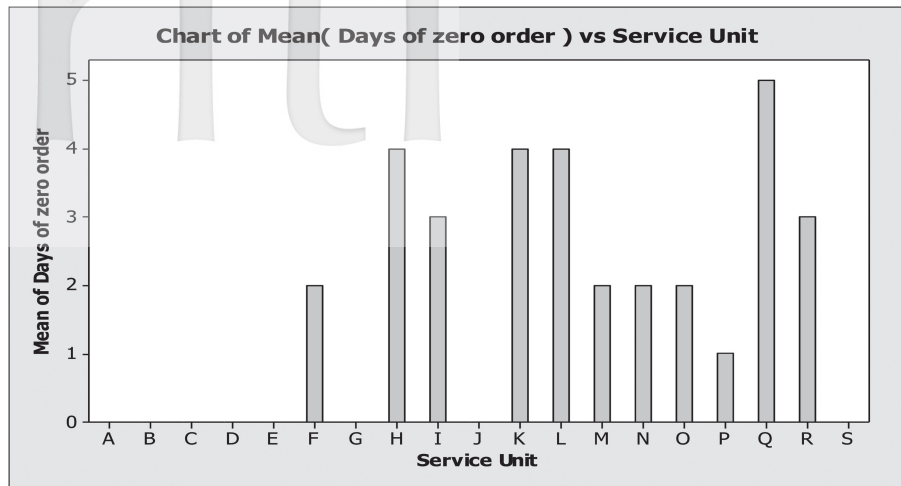


Figure 6. Days of zero order

From Figure 6, the service unit A, B, C, D, E, G, J and S perform well in days of zero order because the order should be made by the customers during all business days and also show the situation of effort from the service units.

(3) Analyze: In the analyze phase, the statistical method can be used to find the root causes and effect. The vital few factors which can affect the output or the customers’ need can be obtained. The regression methods can be used to analyze the root causes and four results of analysis are shown as the following:

**Result 1:** It shows that the number of order can affect the sales significantly. The result is shown as the following and Figure 7 using polynomial regression analysis.

**Polynomial Regression Analysis: Sales versus Number of Order**

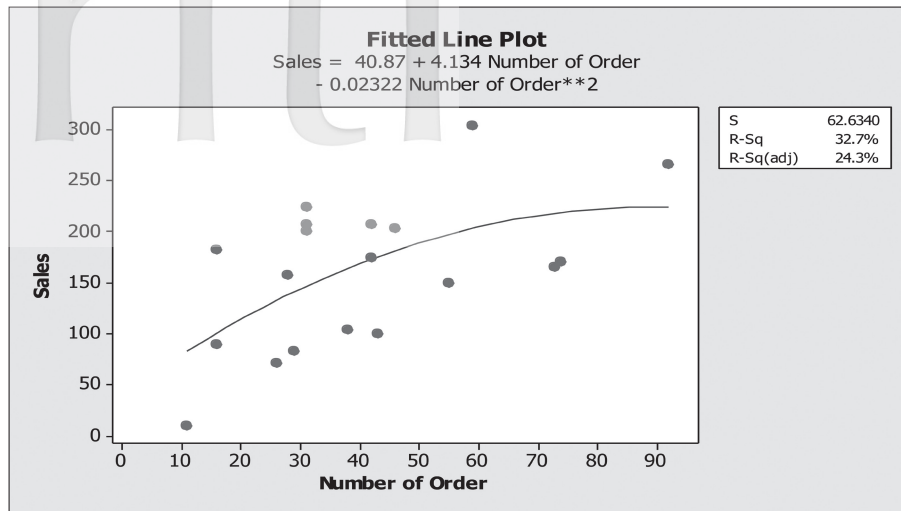
The regression equation is

$$\text{Sales} = 40.87 + 4.134 \text{ Number of Order} - 0.02322 \text{ Number of Order}^2$$

$$S = 62.6340 \quad R\text{-Sq} = 32.7\% \quad R\text{-Sq(adj)} = 24.3\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	30511.9	15255.9	3.89	0.042
Error	16	62768.2	3923.0		
Total	18	93280.1			



**Figure 7. The model of sales and number of order**

**Result 2:** It seems that all factors are not significant to affect the sales if all of these factors are considered together. The result is shown as the following by using regression analysis.

**Regression Analysis: Sales versus Number of Order, Product categories, Number of new customers, Number of customers, Days of zero order**

The regression equation is

$$\text{Sales} = 133 + 1.46 \text{ Number of Order} + 1.23 \text{ Product categories} \\ - 2.14 \text{ Number of new customers} - 1.86 \text{ Number of customers} \\ - 14.2 \text{ Days of zero order}$$

Predictor	Coef	SE Coef	T	P
Constant	133.04	47.94	2.78	0.016
Number of Order	1.460	4.032	0.36	0.723
Product categories	1.2257	0.8627	1.42	0.179
Number of new customers	-2.138	2.320	-0.92	0.373
Number of customers	-1.859	6.087	-0.31	0.765
Days of zero order	-14.19	10.21	-1.39	0.188

S = 57.8297 R-Sq = 53.4% R-Sq(adj) = 35.5%

**Analysis of Variance**

Source	DF	SS	MS	F	P
Regression	5	49805	9961	2.98	0.052
Residual Error	13	43476	3344		
Total	18	93280			

**Result 3:** It shows that the factors of product categories and days of zero order can affect the sales significantly. The result is shown as the following and matrix plot in Figure 8 using





**Figure 8. Sales versus Product categories, Days of zero order**

stepwise regression. As the product categories are increased and days of zero order are decreased, the sales can be improved.

**Stepwise Regression: Sales versus Number of Order, Product categories, Number of new customers, Number of customers, Days of zero order**

Step	1	2
Constant	76.70	120.07
Product categories	1.75	1.75
T-Value	2.90	2.50
P-Value	0.010	0.024

Days of zero order		-16.5
T-Value		-2.11
P-Value		0.051
S	60.6	55.2
R-Sq	33.07	47.65
R-Sq(adj)	29.13	41.10
Mallows C-p	3.7	1.6

**Regression Analysis: Sales versus Product categories, Days of zero order**

The regression equation is

$$\text{Sales} = 120 + 1.42 \text{ Product categories} - 16.5 \text{ Days of zero order}$$

Predictor	Coef	SE Coef	T	P
Constant	120.07	36.02	3.33	0.004
Product categories	1.4240	0.5698	2.50	0.024
Days of zero order	-16.451	7.795	-2.11	0.051

S = 55.2474 R-Sq = 47.6% R-Sq(adj) = 41.1%

#### Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	44444	22222	7.28	0.006
Residual Error	16	48836	3052		
Total	18	93280			

**Result 4:** It shows that the relationship between product categories and sales is nonlinear. As the product categories are beyond 70, the sales can be reduced. The result is shown as the following and Figure 9 using polynomial regression analysis.

#### Polynomial Regression Analysis: Sales versus Product categories

The regression equation is

$$\text{Sales} = -31.64 + 6.479 \text{ Product categories} - 0.04206 \text{ Product categories}^2$$

$$S = 55.8802 \quad R\text{-Sq} = 46.4\% \quad R\text{-Sq}(\text{adj}) = 39.7\%$$

#### Analysis of Variance

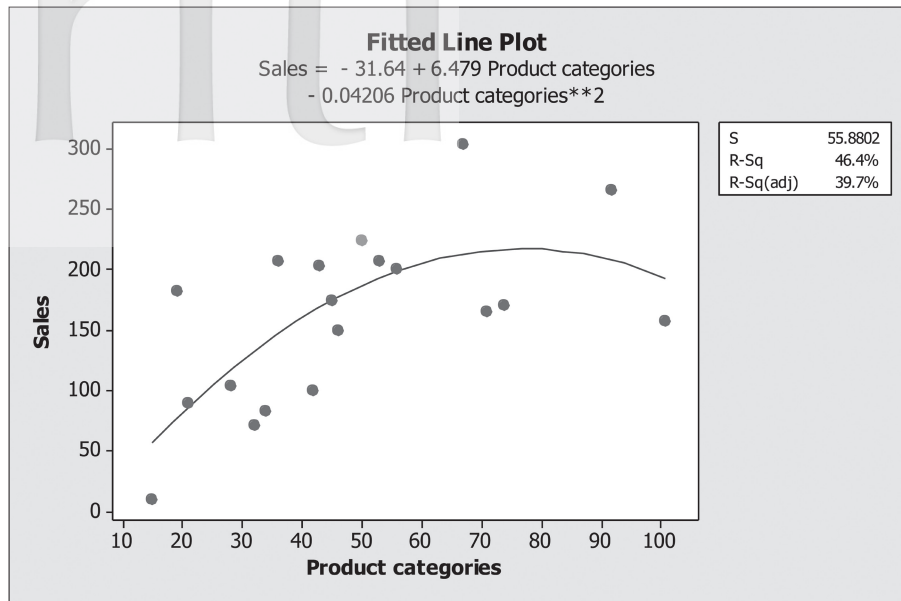
Source	DF	SS	MS	F	P
Regression	2	43318.6	21659.3	6.94	0.007
Error	16	49961.6	3122.6		
Total	18	93280.1			

(4) Improve: In the improve phase, the actions of improvement can be taken to reduce the defects and variation so that the customer satisfaction or the objectives can be enhanced. The preventive actions should be also taken by specifying the tolerance of the critical factors and correct the nonconforming processes.

From the results of analysis phase above, the improvement actions can be taken as the following Table 3. The training system was not set up, standard operation procedure of sales was not consistent due to a variety of products, and different service unit showed different sales style.

(5) Control: In the control phase, the control methods or control chart can be used to control critical input variables and then monitor the critical output variables in order to maintain the effectiveness of the breakthrough improvement. The control actions are shown on Table 4.

On the other hand, the service quality for respective service unit can be obtained from Table 2. by comparing the performance with the top performance and allotting the same amount weight from



**Figure 9. The model of sales and product categories**

**Table 3. Improvement actions**

Item	Improvement Action
Product categories	Set up the number of product categories to be below 70.
Days of zero order	The days of zero order can reduce the sales significantly, and the training will be conducted each month to have the top sales employee to share their successful experience.
Number of order	The number of order can affect the sales significantly. However, as the number of order is beyond 80, the sales can not be increased. Thus, it may be enough to make the best of time to reach 80 orders and increase the sales.
Training system	The service units performing well in the relevant performance direct the training for other service units each month.
Standard Operation Procedures	The standard operation procedures and sales and communication processes can be standardized.
Salesman	The salesmen for the service units will be trained and the service skill can be adjusted. The reward and service system can be also given to promote the sales.

**Table 4. Control actions**

Item	Control Action
Product categories, days of zero order, and number of order	The product categories, days of zero order, and number of order will be monitored each month.
Sales meeting	At the beginning of month the meeting of sales will be held to share the successful experience.
Sales brochures	The sales brochures and pictures and instruction manual are also supplied and updated for the sales service unit for marketing.
Reward and service quality	The sales are evaluated for the service units each month, and the reward is given. The service quality for each service unit is also followed up each month.

these five performances including number of order, product categories, number of new customers, number of customers, days of zero order. That is, the total score of service quality is 100, and each performance has the score 20 for the service quality. Thus, the service quality from the service units can be used to evaluate the effect of service quality on the sales. The result is shown as the following and Figure 10 The model of sales and service quality is also obtained. It shows that the service quality is still not satisfactory, and the sales can be increasingly affected after the service quality is beyond 70. The service quality below 30 can reduce the sales.

**Polynomial Regression Analysis: Sales versus Service Quality**

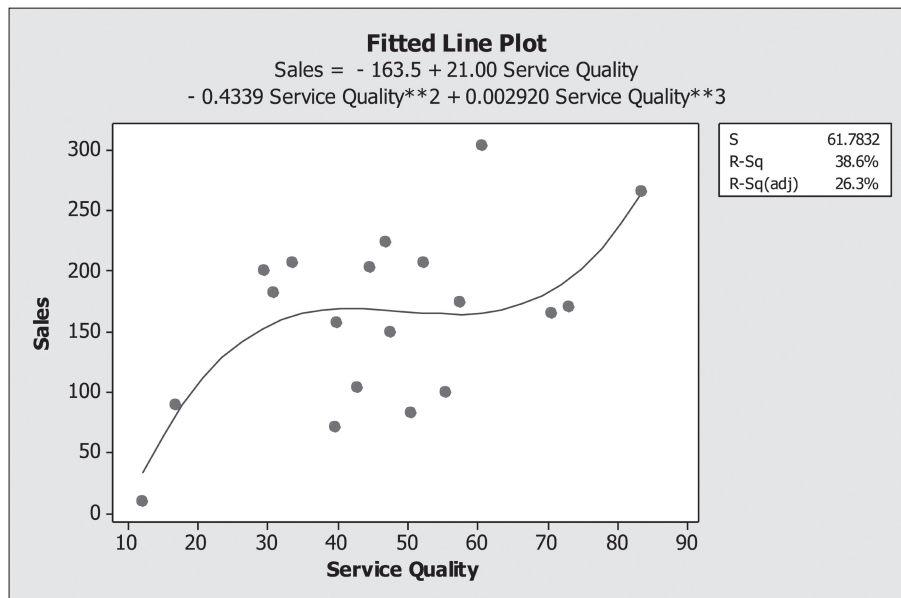
The regression equation is

$$\text{Sales} = -163.5 + 21.00 \text{ Service Quality} - 0.4339 \text{ Service Quality}^{**2} + 0.002920 \text{ Service Quality}^{**3}$$

S = 61.7832 R-Sq = 38.6% R-Sq(adj) = 26.3%

**Analysis of Variance**

Source	DF	SS	MS	F	P
Regression	3	36022.7	12007.6	3.15	0.056
Error	15	57257.4	3817.2		
Total	18	93280.1			



**Figure 10. The model of sales and service quality**

### 3. CONCLUSIONS

Sales in service market are discussed in this practical case by using some methods of feasibility analysis, brainstorming to get the critical input variable, regression methods, and improvement and control actions corresponding to the root causes in this paper. The DMAIC approach is used to give us the clear steps to deal with the sales issue and analyze the relationship among the critical input and output variables and the model can be also obtained. The product categories, days of zero order, and number of order are significantly affect the sales in this research. The service quality can be also obtained from the performances of service units, and hence the relationship between service quality and sales can be evaluated. The methods may be not complex, but can lead to the analysis of critical factors and give the decision makers a right direction of improvement.

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# 六標準差管理之服務行銷分析

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## 摘 要

本研究中，六標準差管理之方法可用於定義服務行銷的要求。相關績效之衡量可包括各服務單位的訂單數、產品類別、新顧客數、顧客數、零訂單數、銷售之績效。影響服務行銷之績效的關鍵因素可予以分析，進而建議與實行服務行銷之改善與控制對策。服務品質亦可被獲得，以評估服務品質對銷售的影響。訓練系統與標準作業程序之建立，可用於銷售之改善與控制。

**關鍵詞：**六標準差、DMAIC(定義,測量,分析,改善,控制)、績效、服務行銷、銷售

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