

# Establishing Customer Service and Logistics Management Relationship under Uncertainty

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*Few studies have investigated how customer service plays its role in logistics management. Despite numerous in-depth researches in supply chain management, the relationship between customer service and logistics management has received little attention. As both activities are practically human-oriented activities, they are inherently difficult to be mutually supportive, particularly in the presence of uncertainty. This study will investigate how they are associated so as to elevate their operational efficiency and quality, thereby reaching higher business achievement. Our proposed approach encompasses three investigative stages. First, we identify the primary factors in logistics activities that affect customer service quality and efficiency. This is accomplished through a set of preliminary survey on small, medium, and large firms. Next, a conceptual model is established based on those factors to serve as a framework for empirical hypothesis of uncertainty relationship. We employ exploratory factor analysis with principal component analysis and One-Way ANOVA to examine the correlation among relevant influential factors. Lastly, we conduct a case study to reaffirm the validity of the model. Our findings reveal that only firm size has no effect on customer service performance. The rest of the hypothesized factors mostly show that both activities have direct positive associations, especially to the financial performance, with a few exceptions on internal uncertainty factors such as executive support, IT use and skills. The benefits will certainly be conducive toward improving customer service performance in support for more efficient logistics management leading to the success of business as a whole. We plan to incorporate stochastic process into the proposed model to accommodate and assess the risk involved.*

**Keywords:** Customer Service, Logistics Management, Relationship Uncertainty, Customer Service Performance

## 1. Introduction

Business competitive pressure forces firms to explore all possible processes or methods to gaining sustainable competitive advantage that enhances both customer's satisfaction and firm's performance (Korpela et al., 1998; Collins et al., 2001; Cheung et al., 2003). This is because customer service is an effective instrument to increase number of customers, sales, profit, shareholders' wealth, and market value through partner relationships and customer loyalty (Collins et al., 2001; Wiles, 2007). Lambert (1992) explained that firm should understand final customer's requirements to establish customer value. With the help of new technology, customer value can be enhanced

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considerably (Renko and Ficko, 2010). One important value to be focused in this study is logistics. Many firms applied enterprise resource planning (ERP) and information systems (IS) to manage and monitor logistics management so as to satisfy the above customer's requirements while making their logistics operation cost effective (Tilokavichai and Sophatsathit, 2011; Celebi et al., 2008; Ngai et al., 2008; Narasimhan and Kim et al., 2001; Cheung et al., 2003). However, as the systems do not operate in stand-alone environment, the unavoidable uncertainties will have an influence on customer service performance (Fink et al., 2008). Some forms of strategic partnership must be incorporated to devise an integrated IS supporting desired service level (Su and Yang, 2010). One of such partnerships is logistics management. The basis of logistics management considers a balance among customer service level, total logistics costs, and total benefits to the firms. Therefore, the firm must efficiently manage these factors to lessen financial burden. Moreover, if the inherent uncertainties could be averted or procedurally managed, improved customer service performance could have been attained. To accomplish the above objectives, the compelling questions addressed in this study are as follows: (1) what are the influential factors on customer service performance? (2) what are the barriers to successful customer service performance? (3) what are the uncertainties that impact on customer service performance? and (4) how does the customer service performance impact to financial performance? These questions will be answered in Section 3 where the proposed model evolves around them.

The organization of this paper is as follows. Section 2 provides some influential prior works to this study. Section 3 describes the research methodology and model. Data analysis and findings are elucidated in Section 4. Section 5 demonstrates a case study of customer service support in a retail household business, along with the result interpretations and discussions. Section 6 concludes with a few thoughts and potential future work.

## 2. Literature Review

We shall look into a few relevant prior works in the sections that follow.

### 2.1 Customer Service

Customer service plays an important role in firms. Many firms are aware of growing customer requirements and adopt sets of standards to evaluate their service for customer's satisfaction (Kisperska-Moron, 2005). Korpela et al. (1998) explained that companies should establish a customer service strategy and focus on designing an efficient logistics system to better serve customer's requirements and sustain competitive advantage. Steven et al. (2012) examined the linkages between customer service, customer's satisfaction, and profitability. They found that customer's satisfaction affected competitive markets. Wouters (2004) addressed four customer service strategic options, namely, integration, adaptation, logistical precision, and standard service level by determining the customer needs accurately and exceeding the needs. The customer service in logistics had a direct impact on a firm's market share, total logistics costs, and profitability (Collins et al., 2001; Bottani and Rizzi, 2006). Berne et al. (2001) explored the variety-seeking negative effect of customer retention that helped lessen the impact of the management efforts and improve service quality and customer's satisfaction. Wiles (2007) examined the shareholder value created by

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customer service discipline of the retailer which is affected by the heuristics and clues used to judge the likelihood of service delivery.

### 2.2 Uncertainty in Customer Service

Ramanathan (2010) explored risk characteristics of products that affected the relationships between logistics performance and customer loyalty such as risks in terms of price and ambiguity of products. The important elements in customer service consisted of order completeness, order accuracy, and stocking levels. Collins et al. (2001) summarized uncertainty variables as follows: order cycle time, consistency and reliability of delivery, inventory availability of delivery, order-sized constraints, delivery time, claim procedure, post-sale support for the product, and order status information. Of particular interest is lead time which has direct effects on customer service level and stock-out costs. One remedy is the use of ERP and IS to support logistics management that satisfies customer's requirements (Tilokavichai and Sophatsathit, 2011; Vickery et al. 2003). Gupta et al. (2000) applied stochastic programming methodology to trade-off between customer demand satisfaction and production costs. Yucesan and De Groote (2000) assessed customer service in an uncertainty environment. Schmitt (2011) developed a multi-echelon model where disruptions could occur at any stage. Chowdhury and Miles (2006) studied customer induced uncertainty in predicting organization design. They found that service firms and manufacturing firms had the same level of customer induced uncertainty.

### 2.3 Customer Service Performance

Vickery et al. (2008) found positive direct relationships between information technology and customer service performance that affected financial performance. Table 1 shows customer service factors considered in this study.

**Table 1: Summary of customer service factors**

| Service factors            | Description   | Related  |
|----------------------------|---|--|
| Lead time                  | Time period starts from customer's order to receive product (order cycle time).                               | Collins et al., 2001; Bottani and Rizzi, 2006  |
| Flexibility                | Capability to change order in terms of due date and quantity when required.                                   | Collins et al., 2001; Bottani and Rizzi, 2006  |
| Accuracy                   | Right quantity, right product, right price in order delivered that mandates accurate invoices to be provided. | Collins et al., 2001; Bottani and Rizzi, 2006; Salema et al., 2007; Hsiao et al., 2010 |
| Reliability                | Capability to deliver customer's order within due date.   | Yu and Li, 2000; Collins et al., 2001; Bottani and Rizzi, 2006; Pishvae et al., 2009   |
| Fill rate                  | The percentage of product available upon customer request.  | Collins et al., 2001; Bottani and Rizzi, 2006  |
| Frequency                  | Number of deliveries achieved in a given period of time.  | Collins et al., 2001; Bottani and Rizzi, 2006  |
| Organization accessibility | Customers can contact firm to submit questions or complaints.   | Bottani and Rizzi, 2006  |
| Complaints management      | Solve problems or errors in service process to meet the quality standards.                                    | Bottani and Rizzi, 2006  |

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It was apparent that most prior work unilaterally focused on individual aspect that influenced customer service. Few accounted for IT relationship and support, which could be seen from myriad of new gadgets and software applications. Studies on logistics activities and potential barriers that affect customer service performance were practically non-existing, let alone additional imposing uncertainty factors. We will present how such relationship can be established in the sections that follow.

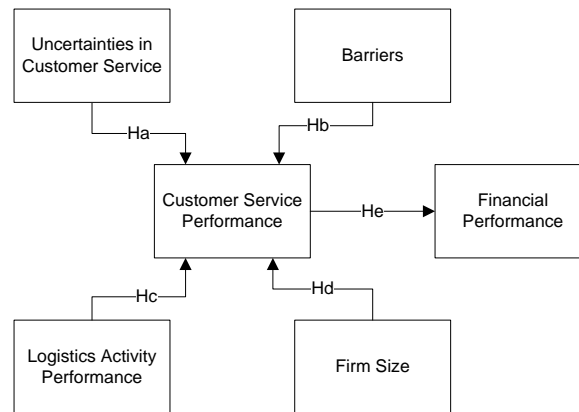
### 3. Proposed Model and Methodology

We have established a research framework and hypotheses on various factors affecting customer service performance shown in Figure 1, where *Ha* denotes uncertainties in customer service having an effect on customer service performance; *Hb* denotes the barriers factors having an effect on the customer service performance; *Hc* denotes logistics activity performance having an effect on customer service performance; *Hd* denotes firm sizes having an effect on customer service performance; *He* denotes customer service performance having an effect on financial performance. The enclosed details in each factor are depicted in Figure 1. Logistics activity performance consists of order processing, demand forecasting and planning, inventory management, warehouse management, reverse logistics, purchasing and procurement, packaging, and transportation. Barriers consist of employee skills, employee turnover, executive support, difficult to use IT systems, communication with vendors and customers. Firm sizes consist of small, medium, and large firms. Uncertainties in customer service consist of product quality, product quantity, packaging quality, vendor's lead time, transportation schedule, number of vehicles in transportation, damage product, IT systems, number of orders, product price, sale order cancellation, customer's demand, returned product, and natural disaster. Customer service performance consists of customer's satisfaction index, number of new customers, average delivery time, product return rate, average stock days, damage value per sales, customer service cost per sales, number of complaints, average response time from sale order, and average waiting time. Financial performance is measured with growth rate.

We also conducted an empirical study to investigate the relationships between customer service performance and logistics management of firms in Thailand. The objectives are four folds: (1) to identify the influential factors on customer service performance, (2) to identify how logistics activity performance and barriers influence customer service performance, (3) to assess the capacity of uncertainty management in customer service, and (4) to find the relationship between customer service performance and financial performance.

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**Figure 1: Research framework of customer service performance**



We created a survey questionnaire consisting of five topics, namely, (1) performance in logistics activities including customer service performance, (2) barriers in logistics management, (3) ability to handle uncertainty in customer service activities, (4) use of customer service performance indicators, and (5) financial performance in firms. The questionnaire used a 5-point Likert scale having 1 being “Strongly disagree” and 5 being “Strongly agree” to distinguish the variations in feedback. Pilot tests on practitioners in customer service were carried out during the development of the questionnaire. From the preliminary 500 questionnaire, 166 respondents had involved in customer service, . Table 2 summarizes company’s profile of the respondents who involve in customer service function. Customer service performance indicators are shown in Table 3.

**Table 2: Profile of respondent companies (166 total)**

| Variable            | Category                  | N   | Rate (%) |
|---------------------|---------------------------|-----|----------|
| Firm size           | Small                     | 41  | 41       |
|                     | Medium                    | 36  | 21.7     |
|                     | Large                     | 62  | 37.3     |
| Operation (Yrs)     | <1 Yrs                    | 2   | 1.2      |
|                     | 1-3 Yrs                   | 15  | 9        |
|                     | 4-6 Yrs                   | 22  | 13.3     |
|                     | 7-9 Yrs                   | 15  | 9        |
|                     | >= 10 Yrs                 | 112 | 67.5     |
| Number of Employees | < 50                      | 68  | 41       |
|                     | 51 – 200                  | 36  | 21.7     |
|                     | 201 – 350                 | 11  | 6.6      |
|                     | > 350                     | 51  | 30.7     |
| Revenue (Baht)      | < 30,000,000              | 48  | 28.9     |
|                     | 30,000,001 – 50,000,000   | 24  | 14.5     |
|                     | 50,000,001 – 100,000,000  | 20  | 12       |
|                     | 100,000,001 - 200,000,000 | 5   | 3        |
|                     | > 200,000,001             | 69  | 41.6     |
| Growth Rate (%)     | < 3%                      | 9   | 5.4      |
|                     | 3-5 %                     | 55  | 33.1     |
|                     | 6-7 %                     | 32  | 19.3     |
|                     | 8-9 %                     | 15  | 9        |
|                     | 10-11 %                   | 27  | 16.3     |
|                     | 12-13 %                   | 6   | 3.6      |
|                     | 14- 15 %                  | 6   | 3.6      |
|                     | > 15%                     | 16  | 9.6      |
| Trend of Sales      | Decrease                  | 21  | 12.7     |
|                     | Equal                     | 10  | 6.0      |
|                     | Increase                  | 135 | 81.3     |

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**Table 3: Customer service performance indicators in firms**

| Customer service performance indicators | Adopted   |      | Not Adopted |      |
|---|-----------|------|-------------|------|
|   | Frequency | %    | Frequency   | %    |
| 1.Customer's satisfaction index         | 141       | 84.9 | 25          | 15.1 |
| 2.Number of new customers               | 137       | 82.5 | 29          | 17.5 |
| 3.Average delivery time                 | 139       | 81.9 | 30          | 18.1 |
| 4.Product return rate                   | 121       | 72.9 | 45          | 27.1 |
| 5.Average stock days                    | 117       | 70.5 | 49          | 29.5 |
| 6.Damage value per sales                | 116       | 69.9 | 50          | 30.1 |
| 7.Customer service cost per sales       | 113       | 68.1 | 53          | 31.9 |
| 8.Number of complaints                  | 113       | 68.1 | 53          | 31.9 |
| 9.Average response time from sale order | 111       | 66.9 | 55          | 33.1 |
| 10.Average waiting time                 | 92        | 55.4 | 74          | 44.6 |

The results of adoption from 141 firms or 84.9 % use customer's satisfaction index most because they would like to keep the customers. The second highest indicator is number of new customers (representing sales volume) being selected by 137 firms or 82.5 %. Other indicators are time, cost, and reliability.

### 4. Data Analysis and Findings

We employed exploratory factor analysis (EFA) to examine the underlying dimensions in order to reduce uncertainty variables in customer service. We also applied principal component analysis (PCA) to extract the factors loading and varimax rotation method to classify the variables into relevant factor grouping. In which case, the eigenvalue of any factor should be greater than one (Hair et al., 1998). In addition, the Kaiser-Meyer-Olkin (KMO) measure was applied to detect any prerequisite of a good factor analysis setting the minimum acceptable value at 0.5 (Kaiser, 1974). Items were validated by factor validation having factor loading exceeding 0.4 (Nunnally, 1967). In the meantime, factor reliability was measured by Cronbach's alpha to ensure the internal consistency of multi-item scales to be no less than 0.6 (Nunnally, 1967). Table 4 shows the results of EFA grouping and validation.

**Table 4: Results of exploratory factor analysis of uncertainty for items in customer service**

| Factor                                     | Internal uncertainty   | External uncertainty   |
|--|--|--|
| Cronbach's $\alpha$ = 0.892<br>KMO = 0.848 | Product quality<br>Product quantity<br>Packaging quality<br>Vendor's lead time<br>Delivery lead time<br>Transport schedule<br>Number of vehicles in transportation<br>Damage product<br>IT systems | Number of order<br>Product price<br>Sale order cancellation<br>Customer's demand<br>Returned product<br>Natural disaster |
| % variance                                 | 29.950   | 25.201   |
| Eigenvalue                                 | 4.492  | 3.780  |

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The results yield 0.848 (>0.5) KMO value and 0.892 (>0.6) Cronbach's alpha value, which denotes good factor analysis and reliable, respectively. Notice that uncertainty items in customer service were classified by internal and external uncertainties. Internal uncertainty consists of product quality, product quantity, packaging quality, vendor's lead time, delivery lead time, transport scheduling, number of vehicles in transportation, damage product, and IT systems. External uncertainty encompasses number of orders, product price, sale order cancellation, customer's demand, returned product, and natural disaster. The total variance percentage of both internal and external uncertainties is 55.151. This implies that they account for over half the performance data variations.

Setting Pearson correlation coefficient at 0.05 significant level, we found that customer service performance did have association with logistics activity, uncertainties, barriers, and growth rate. This is summarized in Table 5. The one-way analysis of variance (One-Way ANOVA) and least significant difference (LSD) for multiple comparisons factors yielded different comparative results in each group-pair.

**Table 5: Summary of customer service performance association**

| Association                  |                                | Results                      | Pearson Correlation | P-Value  |       |
|------------------------------|--------------------------------|------------------------------|---------------------|----------|-------|
| Customer service performance | Logistics activity performance | Order processing             | Associated (+)      | 0.493**  | 0.000 |
|                              |                                | Purchasing and procurement   | Associated (+)      | 0.330**  | 0.000 |
|                              |                                | Transportation               | Associated (+)      | 0.492**  | 0.000 |
|                              |                                | Warehouse management         | Associated (+)      | 0.503**  | 0.000 |
|                              |                                | Inventory management         | Associated (+)      | 0.471**  | 0.000 |
|                              |                                | Demand forecasting           | Associated (+)      | 0.446**  | 0.000 |
|                              |                                | Packaging                    | Associated (+)      | 0.422**  | 0.000 |
|                              | Reverse logistics              | Associated (+)               | 0.444**             | 0.000    |       |
|                              | Uncertainty factors            | Internal uncertainty factors | Associated (-)      | -0.162*  | 0.037 |
|                              |                                | External uncertainty factors | No associated       | -0.004   | 0.956 |
|                              | Financial Performance          | Growth rate                  | Associated (+)      | 0.232**  | 0.003 |
|                              | Barriers                       | IT systems difficult to use  | Associated (-)      | -0.346** | 0.000 |
|                              |                                | Executive support            | Associated (-)      | -0.291** | 0.000 |
|                              |                                | Employee skills              | Associated (-)      | -0.196*  | 0.011 |

\*\* Correlation is significant at the 0.01 level (1-tailed).

\* Correlation is significant at the 0.05 level (1-tailed).

One noteworthy finding was that firm size played no role in customer service performance because all firm concentrated on customer satisfaction. Note also that customer service performance has positive associated with all logistics activity performance and financial performance. The interpretation is straightforward. If customer service performance improves, financial performance will increase because of firms can retain old customers and increase new customers that boost total sales. On

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the contrary, it has negative association with barriers and internal uncertainty factor. This is a forewarning sign to responsible parties as they affect customer service performance directly. Case in point, if the employees lack the necessary skills or the IT systems are difficult to use, service performance will drop as they take more time to communicate and serve the customer. This shortfall can be remedied by executive support (barrier) through training programs, customized IT systems for support operations. The good news, however, is that the level of customer service performance depends solely on each firm's own policy and administration. No external uncertainties can influence it. Therefore, firm should improve logistics activity performance, eradicate barriers, and manage internal uncertainty to improving customer service performance that ultimately has positive effect on company's growth.

### 5. Case Study

The case study was taken from a 30-year old retail business in household products which will be referred to by GGG company for identity confidentiality purpose. Based on our literature review, some predominant logistics activity support tools implemented by the company are listed in Table 6.

**Table 6: Logistics activity support tools of GGG Co., Ltd.**

| Year | Tools to support customer service   | Description   |
|------|---|---|
| 2001 | -Oracle ERP, Intranet   | -Use ERP and Intranet   |
| 2002 | -Product knowledge base<br>-Business intelligence system (Client-server)                      | -Manage product data<br>-BI : analyze data                                    |
| 2003 | -Vendor online (Online purchasing)  | -Reduce time for purchasing   |
| 2004 | -VMI (Replenishment, Min-Max)   | -Available products   |
| 2005 | -www.GGG.com,<br>-Product library (Kiosk),<br>-BI (Web based)                                 | -WWW<br>-customers can search product data by themselves<br>-BI : easy to use |
| 2006 | -Distribution center (DC)   | -Distribute products to branches  |
| 2007 | -Customer's satisfaction measurement (Smile project),<br>-Delivery system (Trips and Routing) | -Improve service<br>-On time delivery   |
| 2008 | -GPS system (Track delivery system ),<br>-Member system (Reward/redeem point)                 | -Track delivery<br>-Customer loyalty  |
| 2010 | -Call centre,<br>-SAP ERP,<br>-BI (Web based) and dashboard                                   | -Customer support<br>-Use SAP ERP<br>-Easy to use and more features           |
| 2011 | -Updated sales order system   | -Reduction in order cycle time  |

Figure 2 shows annual cost of goods sold (COGS) and inventory cost. In 2006, GGG set up a distribution center (DC) to distribute products to branches. Turnover ratio computed from COGS divided by inventory cost increased which meant that the firm could reduce inventory cost while increase sales. Thus, DC could support customer's requirements and increase satisfaction.



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**Figure 2: Graph of annual cost of goods sold and inventory cost (Baht).  
(\$1 = B31)**

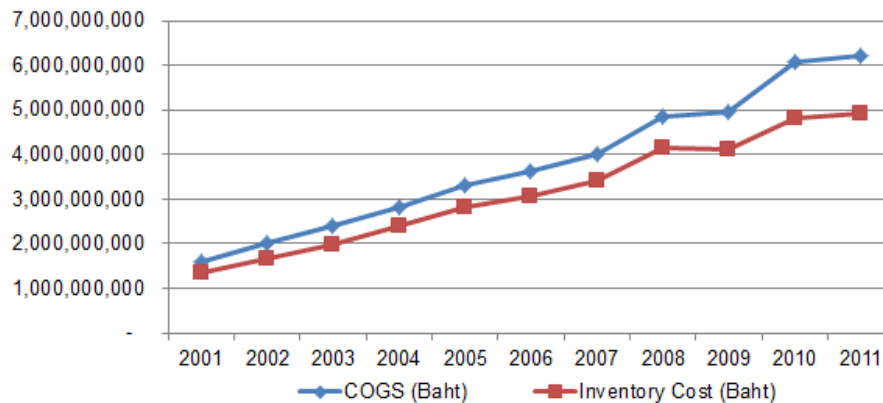
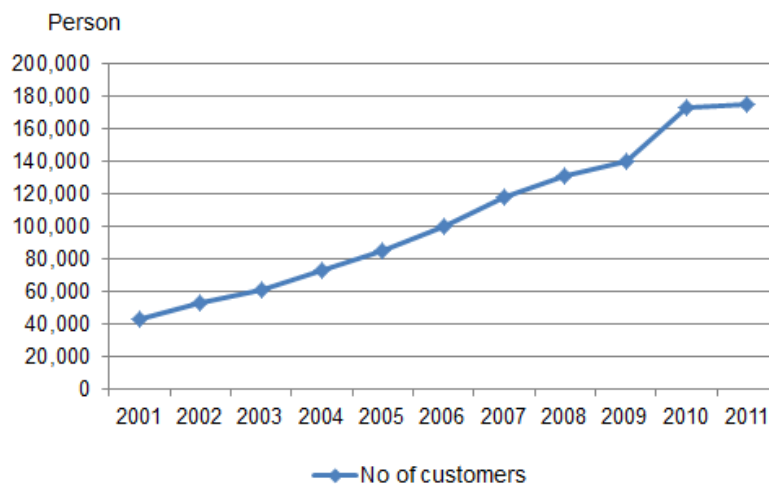


Figure 3 shows the number of customers steadily increases as customer service improves. In 2007, GGG developed a delivery system to improve delivery time. In 2008, they established a member system to retain customer loyalty through promotion campaigns. In 2010, they set up a call center to better serve the customers. Moreover, SAP ERP and BI were introduced in operations and supported decision making. In 2011, a sales order update system was set up to reduce order cycle time. All these efforts accompanying by proper supporting tools help increase sales volume, reduce inventory costs, increase new customers, and maintain customer's loyalty. GGG encounters many uncertainty factors in logistics activities such as out of stock, cancellation of sale order, product returned, cancellation of purchase order, lead time problems from vendors, and lead time problems affecting customers. These uncertainty factors affect customer service performance that deteriorates customer's satisfaction. As GGG employed many tools (from Table 6) to support customer service operations, the above problems that mostly caused by uncertainty became manageable. For instance, installation of the delivery system in 2007 set the pace for on time delivery; they introduced membership system in 2008 to create customer loyalty; call center support was set up in 2010; and sale order system was revamped in 2011 to reduce order cycle time. Hence, variation in logistics factors affects or relates directly to customer service performance that must be planned and administered properly.

**Figure 3: Graph of number of customers**



## 6. Conclusion

In this paper, we have investigated items that influence customer service performance. As customer service can bring about performance and financial gains for firms, special attention must be paid in planning and operation. Analysis of the model framework and hypotheses furnishes some in-depth considerations of customer service and logistics management relationships. From our findings, logistics activity directly affects customer service performance in various unpredictable manners. Most influential factors came from internal uncertainty items that were positioned as negatively associated with customer service performance, while external uncertainty items played no role in the association. The intriguing twist is the firm size which is not related by any means. This is because every firm concentrates and concerns about customer's satisfaction. Therefore, all firms try to attain competitive advantage from customer loyalty as customer service performance has a direct relationship on gaining financial performance. Complication as the uncertainty has brought about, we plan to incorporate stochastic process into the proposed model to accommodate and assess the risk involved, the effect, and higher performance of customer service level.

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