

# Paper

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# Marketplace Based Application System to Improve Customer Satisfaction on Laundry Business

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**Abstract.** Laundry service shop customers are presently confronted with several service options, qualities, and features. This is due to the inconsistent operational management of these organizations, in delivering maximum satisfaction. These problems often lead to the unsatisfactory level of customers, as they begin to search for better laundry service alternatives, which consumes much time and effort. The studies on laundry service shop businesses have also been widely carried out, as they are found to only focus on the ease of management due to delivery to one shop, which is equipped with features of comfortable services and payments. However, it has not been able to handle the demand of customers and various items, which needs to be sent to different laundry shops. Based on these studies, the laundry business concept should be developed to improve service qualities, with customers having the option to distribute their laundry items to desired laundry service shops, through the placement of one order. According to the development of this system, a sequential simplification from multi to single orders was observed, as the marketplace concept was also used. Furthermore, the manager handled and simplified the multi-order process, which was carried out by distributing orders to several shops, arranging the pick-up and delivery procedures, as well as receiving and transferring payments to all laundry services. The result showed a comparison between the mobile-based laundry business and traditional systems, respectively. This new system result is saving more time and shipping costs, as it handled simple to complex laundry needs with a single click on the application, compared to the old traditional laundry business that involved multi orders. In conclusion, this new marketplace-based application system saves more time and cost, leading to the higher customer satisfaction in laundry business.

## INTRODUCTION

The problem in laundry business includes the operational management, which is presently not satisfying the customers, due to the inconsistencies of the service options, qualities, and features [1]. This leads to disappointments being observed from customers, such as mixed-up clothes, late delivery, no detailed record of attires, and lack of notification when the service was complete [2]. Another problem is also found on the business side, such as how customers select a suitable company, regarding service quality and speed, which are often tested before obtaining results. Based on this company, the problem focuses on how perfect services are provided to customers, such as the notification of pick-up and delivery, regular schedule, cheap cost, and satisfactory qualities. This pick-up and delivery feature specifically needs the involvement of couriers, which in turn yields additional income for the third parties. Furthermore, several studies have been conducted to solve this problem, with majority focusing on the involvement of information technology.

The study of Khoirunnissa et al.[3], developed a laundry management application and data integration that used web services with transaction features, expenses, as well as profit and loss reports, which includes customers' data [3]. Furthermore, Devi et al. [4], also developed a web-based laundry analysis by using the waterfall method, in order to solve manual administrative processes [4]. Otawkar et al. [5], further developed a web-based application to reduce

manual catalogs and errors, as well as carry out automatic backups [5]. Also, the study of Shoewu et al.[2], developed a laundry management system, which determined the finish date and number of clothes washed, reduced the delay time, as well as facilitated future activities [2]. However, these previous studies generally focused their information technology on one laundry enterprise, compared to several shops such as the marketplace concept.

Based on previous presented solutions, this study develops a laundry management system, in order to improve quality services through the marketplace concept. According to previous comparisons, the advantage of this study depends on the option of vendors, due to the desire of customers. These vendors are selected by the system, due to matching the criteria being determined by the customer. Based on these conditions, baskets of laundry are being provided by the customers, due to the possibility that some clothes are likely to be completed by vendor A or B. Furthermore, the system automatically calculates order and allocate charges to each vendor, through the use of one command and payment method.

Marketplace based application system for laundry as the proposed system offers many advantages compared to that of the traditional. Customers are able to directly order few laundry services with variations that are suited to their needs with only one click. Moreover, they are only charged for a one-time delivery service. This system is more convenient with the traditional laundry service, where customers have to make a few times before ordering for different services and are charged for each courier. Therefore, the laundry courier service with one shipping fee becomes cheaper, more effective and efficient.

### **Studies on Laundry Business**

Guo and An [6], demonstrated the success of verifying basic functions, such as online catalogs, price comparisons, and payments from electronic marketplaces [6]. This study showed that there were similar basic functions that was applied to all types of e-marketplaces, which included IT products, transportation, health, etc.

Nugraha [7], tried to develop a marketplace information system for laundry, which was found to only achieve the design stage [7]. This was due to the assumptions and decisions to automate simple administrative processes, such as customer registration, locating vendors without criteria, as well as direct order and payment of products. Based on the limitation of this study, it was unclear how laundry items reached the vendor, as there was also a direct delivery process to the customer without payment confirmation from the marketplace. Furthermore, the use of multi orders in several laundry shops was another limitation, as customers were unable to place single commands.

Otawkar et al. [5], developed an online web Laundry Service System, with features of demand, dry cleaning, express, and subscription-based services [5]. The main advantage of this system was due to its fully customized responsiveness, based on being a web-based application that reduced manual catalogs, as well as eliminated errors and backups. It was also equipped with order tracking, pick-up and delivery features, as well as payment processing. However, the disadvantage was due to the unsatisfied customer being unable to select a vendor, which in turn led to alternative searches on other online laundry sites.

Devi et al. [4], also developed a Laundry Information System, which possessed a feature that washed clothes shoes, and helmets [4]. This system was also equipped with a mobile application and web-based admin system, for the accessibility and management of laundry services, respectively. Furthermore, there was an application for couriers that were in charge of picking up and delivering results. However, this system only handled one laundry company, as there was no option for customers when they became unsatisfied with the services.

Furthermore, Rachmawati et al. [8], analyzed customer satisfaction level on services in Small Medium Enterprise (SME) class laundry companies, considering that several organizations were in the middle category, including SMEs [8]. This study was conducted in three stages, namely developing, testing, and evaluating a customer satisfaction measurement system, respectively. Several measured factors included, employee courtesy and professionalism, speed of pick-up and delivery services, cleanliness of laundry results, and timely finishing schedule. The results showed that the system had two types of satisfaction analysis, namely simple and complex measurements. These measurements were used to obtain present and quick information, as well as produce comprehensive data related to customer satisfaction and service.

Shin et al. [9], examined the effect of CSMA (corporate sustainable management activities) on CRM (customer relationship management) [9]. Although few studies have addressed the three dimensions of CSMA (environmental, social, and economic), this study investigated its effect on customer satisfaction (CS), word of mouth (WOMI), and repurchase intention (RI). Based on a survey conducted in South Korea, the results showed that environmental and economic aspects of CSMA played an important role in increasing CS, which positively affected WOMI and RI.

Khan et al. [10], also explained the daily use of battery life for smartphones in laundry services [10]. Based on a large number of daily activities in using various applications, studying their effects on battery life was very necessary.

The application developed was known as the Smartphone Task-based Energy Monitoring System (STEMS). This system was used to estimate the diverse and daily power consumption of smartphone usage for applications. The results of this study showed that activities that required internet connectivity were more energy-consuming than others. This was found to be useful to stakeholders, such as application designers and developers, PIM managers, and end-users.

Luca [11], also explained the online sales market, where several small sellers required help in trading at low costs [11]. One major challenge encountered by marketplace designers was how to build trust, towards facilitating transactions between unknown strangers. Furthermore, this study provides an online marketplace design with a focus on trust and reputation mechanisms. The results indicate that the decisions made by the marketplace platform depend on ethical, legal, operational, competition, and public relation considerations, respectively. This study also provides insight into the principles that underline the design of reputation systems, in order to help reduce discrimination within the digital age.

## MATERIAL AND METHODS

The new system proposed use the marketplace concept [6,7], where the customers were served with an option of laundry business company lists. Based on this concept, the customers initially focused on the products and features from each laundry service shop, before the selection process, as presented in Fig. 1. For example, laundry service shop A has the characteristic of being able to wash and dry clean clothes, while laundry service shop B has the ability to cleanse large size bed linen without having the drying feature. Meanwhile, laundry service shop C washed shoes, which its service is not carried out by laundry service shop A and B. Based on the use of one order, the customers divide the laundry items between the laundry A, B, and C shops. Furthermore, the distribution of each item was determined by the customers, due to their desire for certain types of laundry item. Based on this condition, the proposed system automatically and virtually allocated requests into 3 orders, without customers bothering to make the distributions.

Another feature was the presence of a service courier, which helps in picking up and delivering the laundry items. Furthermore, the system requires the payment with only one shipping fee, compared to ordering thrice with three delivery costs. This ensures more savings on the customer's side, with the aim of increasing their satisfactory level. According to the study of Rachmawati et al. [8], pick-up and delivery services increased customer satisfaction [8]. The system also provided notifications when the laundry was complete, as new payments were made after the retrieval of items. This payment system was selected according to the preference of the customers, either by transfer or making a previous deposit to the marketplace admin. Based on the first picture in Fig. 1, a customer was confused due to having several types of laundry item to be sent to a laundry shop. In the second picture, several options in terms of quality and price were provided to the customer. The order button was further clicked after the payment process finished, as well as selections of laundry shop and item options. This order processed by the marketplace admin, and a notification will send to each laundry shop, based on confirmation and approval of the customer's request.

The new marketplace laundry system offered offer many conveniences compared to that of the traditional. Customers are able to directly order few laundry services with variations best suited to their needs in one click. They are also able to indicate when they need the services of various laundry shops, and are charged for a one-time delivery service by the courier. This is in contrast with the traditional laundry service, where customers have to make a few times before ordering for different services and are charged for each courier. Therefore, the new system proposes more effective and efficient services as well as cheaper cost with one shipping application.

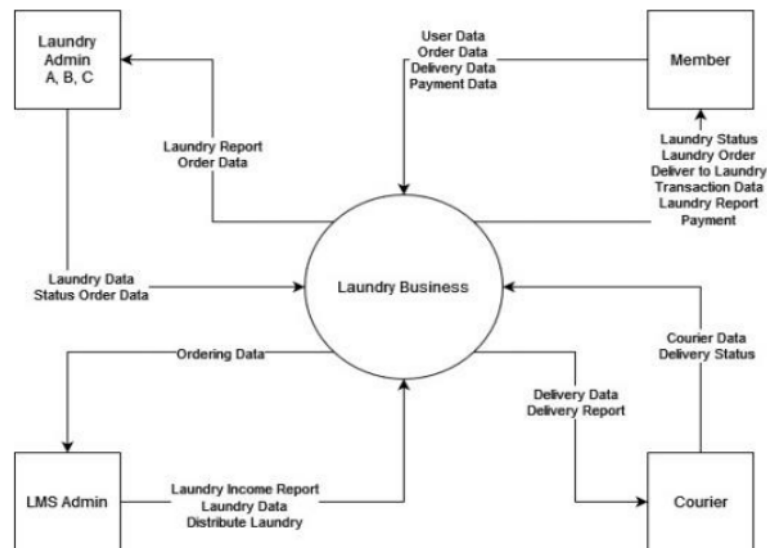
Based on the agreement of all the laundry service shops business, the procedure continues towards the courier search process, in order to pick up and deliver items to each shop. The system is found to automatically notify the customer after the completion of the order, as shown in the third figure of Fig. 1. Therefore, the customer awaits the courier service delivery. This delivery process involves the gradual collection of items from the laundry shop, which are combined and sent to the customer, as shown in the fourth picture of Fig. 1. Furthermore, the use of a mobile application by involved users is another factor to be considered when making order and confirmation transactions, except for the marketplace admin that utilized web services on the desktop. Therefore, the use of smartphones in conducting transactions through an internet connection was very wasteful in battery usage [10]. This was a concern for laundry shop admins and couriers, as all smartphones were to always be on standby in receiving and processing orders from customers at any time.

Four entities generally have an important role in the operation of the laundry business. The first entity is the members or end-users, which interacts with laundry business to make orders and payments, as well as information related to the user. Based on this process, members also receive updates regarding the laundry orders, as well as data related to reports, payments, and transactions. The next entity is the laundry business admin, which controls the laundry distribution data in the multi orders and to the courier. This entity also manages the process of distributing payments

from members to all laundry shops. Based on completing the distribution, a courier entity whose job is to receive the laundry items, is observes. This entity also plays a role in updating their position, as the shops and members found the location to prepare and process their transactions. The next entity is the laundry admin, whose responsibility is to manage the items. This laundry party also receives incoming order data and updates from the courier. Furthermore, laundry shops can see the sales report made in their laundry business, and are also can update order information to members.



**FIGURE 1.** New concept of laundry business



**FIGURE 2.** Data flow diagram of new laundry business

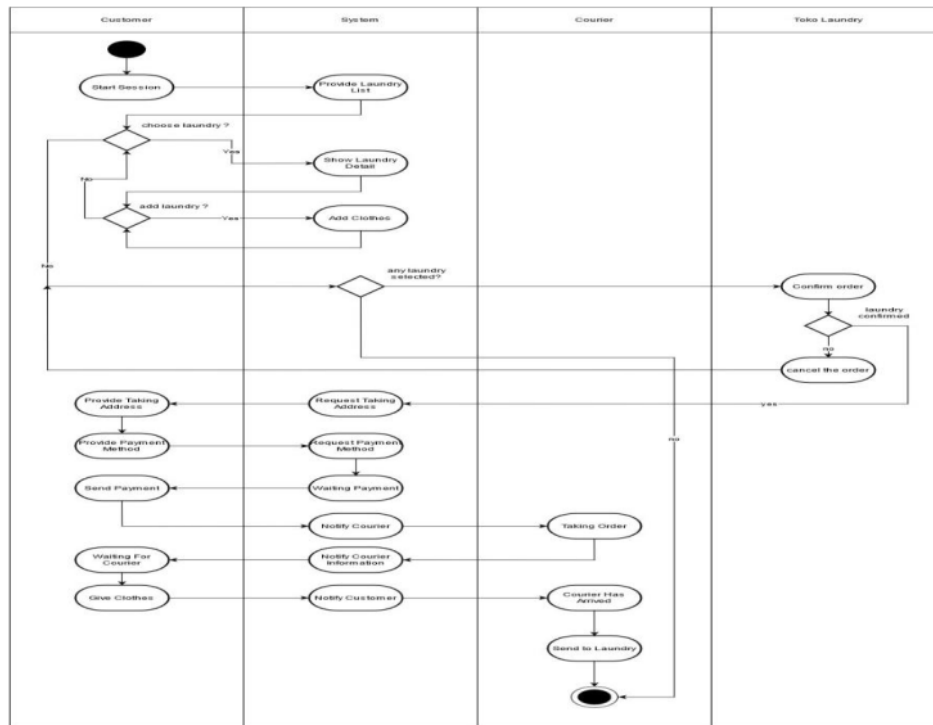
Based on Fig. 3, Fig. 4 factors involved in the process include customer, system (marketplace admin), courier, and laundry shop. Firstly, the system provides data in the form of selectable laundry shops, when the customer enters the page. This customer selects the shop according to their needs, as the laundry items are included in the shopping cart. Based on this condition, the customer is entitled to enter several laundry shops in one order. When there are no more items, the process continues to the checkout page, where the address of the customer is to be inputted, in order to determine the pick-up point. Furthermore, the total costs and that of the courier service are displayed, with the selection of a payment method to process the order. This process continues by making a payment, with the system notifying the nearest courier service to receive the orders. The laundry items are further provided to the courier service, based on being sent to the selected shops.

## RESULT

The design and activity diagram previously described are implemented on mobile devices by using Android and Visual Studio, which involves the customer, laundry shop, and courier. Meanwhile, the admin process algorithm is implemented in the form of a web. Furthermore, application testing is carried out in a limited area within the same city, namely Surabaya, Indonesia, due to the use of motorbikes by the delivery service couriers. This indicates that the laundry marketplace system is only feasible to be implemented in a limited area of 20-30 kilometers in diameter.

Figure 4 shows the option of laundry service shops and categories, as the customer selected more than one location with different items.

Based on Fig. 6 (left), the customer can input the address and select the payment method, after choosing the desired laundry items and services in more than one laundry service shop. Although there was more than one laundry service shop option being clicked and chosen, the customer still paid for only one shipping fee. Therefore, with this system, customers are able to cut cost on shipping services, compared to the old traditional system.



**FIGURE 3.** Activity diagram for the customer, laundry shop & marketplace admin, and courier

Figure 6 (right) shows that the delivery process to the selected laundry service shops monitored in the customer's smart-phone screen, after the courier service picked up the laundry items. Therefore, the courier service sends the laundry items to the first and second laundry service shops, respectively. With this new system, customer are able to save more time in sending and picking up their laundry, and this in turn increase their satisfaction. Customers are able choose the desired feature based on each laundry service shop that needed, as shown in Fig. 5.

Examples from Fig. 6, Fig. 7, and Fig. 8, show the different time and cost consumption when the customer utilized the old system compared to the new. In the traditional system, when the customer decides to order laundry services from two shops, the courier service charge for double time. Therefore, the courier cost was Rp20,000 for 1st laundry shop and Rp25,000 for the 2nd (10 km distance), with the total being Rp45,000. The difference in cost was because courier service cost is approximately Rp2,500/km for the first 20 km with the minimum order of Rp20,000, - and for the sequent is charged for Rp3,500/ km.

The new of marketplace-based application system allows the customer to order laundry service from 2 shops, this only take a one-time order. Also, from the example in Fig. 6, the courier service cost for the two laundry shops using the new system is only Rp25,000 because both places are directly on the same route (10 km distance).

From Fig. 6, Fig. 7, and Fig. 8, the new system with one time order, saves time and cost by cutting Rp20,000 for the customer. Therefore, this proposed marketplace-based application system results in increased customer satisfaction in laundry business.





FIGURE 4. Selection and category of laundry service shops

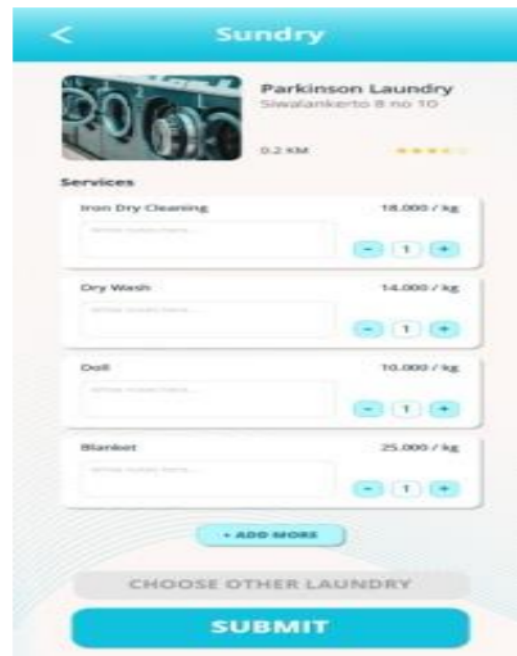


FIGURE 5. Features for laundry shop



FIGURE 6. Process of check out and payment (left) and laundry delivery/pick-up process monitored from Google Map(right)

**Sundry**

Pickup Location

SET ADDRESS

Summary

Clarisse Laundry	
1 Dry Cleaning	14.000
3 Doli	30.000
Subtotal	Rp 44.000
Delivery Fee	20.000
<b>Total Payment</b>	<b>Rp 64.000</b>

Payment Details

BCA

mandiri

Please follow instruction below

ATM Mandiri

1. Insert your card, then input your PIN
2. Go to Payment
3. Input the Biller Code
4. Input the Total Payment
5. Confirm your transaction

BCA

**ORDER**



FIGURE 7. (Left) Order Fee from Laundry 1 with the old traditional system, and laundry delivery/pick-up process monitored from Google Map (right);

**Sundry**

Pickup Location

SET ADDRESS

Summary

Parkinson Laundry	
1 Dry Wash	14.000
3 Doli	30.000
1 Bed Cover	120.000
Subtotal	Rp 164.000
Delivery Fee	25.000
<b>Total Payment</b>	<b>Rp 189.000</b>

Payment Details

BCA

mandiri

Please follow instruction below

ATM Mandiri

1. Insert your card, then input your PIN
2. Go to Payment
3. Input the Biller Code
4. Input the Total Payment
5. Confirm your transaction

BCA

**ORDER**



FIGURE 8. (Left) Order fee to the 2nd laundry shop with the old traditional system and laundry delivery/pick-up process monitored from Google Map(right)



## DISCUSSION

Based on comparisons with previous studies[1]–[5], [7], [8], some of the improvements made in this study are summarized in Table 1. These comparisons are made with the assumption that the customer has several items to be washed, such as: daily (shirts, pants), party clothes, curtains, blankets, shoes, suitcases, jackets, and bed covers.

**TABLE 1.** Comparison of concepts between the old laundry business and the proposed laundry business

Item Compared	Previous Laundry Business	New Laundry Business Concepts
Number of laundry service shop/orders	One laundry service shop	More than one laundry service shop
Type of laundry items	One type of laundry item	Various type of laundry item
Number of order	Multi orders	Single order
Number of courier service involved	Many courier services	Only one courier
Cost		
Time	More Expensive	Cheaper
Payment amount	Relatively long	Relatively short
	Multi payment	Single payment

Based on the old traditional laundry business system, Table 1 shows that customers are forced to divide their items into several laundry service shops and to do that, it will take more time. Meanwhile, one shop was unable to provide services for some specific items, such as washing for shoes and suitcases, which requires a special service company to handle the laundry process, by using the right equipment and expertise. Furthermore, the old traditional system forced the customer to send different items to several shops, which automatically consumed much time and cost. However, they only need to place a single order in the new laundry business system towards washing complex items, while sending simple laundry to the old shop based on expectations and quality. The customers are also able to choose the cheapest laundry service shop, as a pick-up process is found to be needed in the old traditional system.

Based on the limitations of this study, the application of the new laundry system is only effective in a limited area. Another obstacle was the difference in the work speed of each shop, which led to the possibility of different completion time. Based on this condition, the courier should wait for the latest results time before making a single delivery. Furthermore, the pick-up and delivery costs were slightly expensive when the selected shops are located far apart. The system also charges fees according to the distance travels by the service courier, which allows optimization based on the shortest distance. Therefore, the pick-up and delivery routes should be optimally calculated by using an algorithm, which should be consider during the processes of future studies.

## CONCLUSIONS

Based on the concept of the newly developed laundry business system, this study proves that the new system has succeeded in simplifying the process of laundry's process and delivery, compares to the old traditional system. In the old traditional system, customers had to carry out multi orders to several laundry service shops, which has been simplified to a single command by the new system, with the ability to distribute laundry items to many laundry service shops. Besides that, customers also can choose these laundry service shops according to customer's desire, quality, and price, by using the marketplace concept. Another advantage is that the new system only needs one service courier for all laundry shops, which in turn speed ups the search process also. Based on the financial of the old and new systems, the customer previously had to make several separate payments and now only do the single payment system to each shop. This leads to the task of the marketplace admin, which is to distribute payments to each laundry service shop. Therefore, the effect of this new system is the increased task complexity of the marketplace admin, which should be able to effectively distribute the payment of several laundry shops. A task that is better handled by development of the marketplace admin system.

## ACKNOWLEDGEMENTS

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