



## A Framework for Predicting Personalized Product Packages

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### ABSTRACT

A package is to sell more than one product together to consumers in a single order and price, which is offered to customers for various purposes, like discount offer, to increase sales of new and old products. Most often, it is very hard for customers discovering their need among billion of products by browsing a lot of menus. Since, consumers always do not have enough time to add items to the basket and that is why, they expect to buy with a single click. It has been found that the current package building technologies are not enough to fulfill e-commerce marketers' demand because these are not able to hold customers tightly in the every step of purchase life cycle. Meanwhile, shopping merchants invest more than billion dollars to make right tools to sell packages by encouraging customers. On the other hand, in the existing bundle methods where users are forced to buy extra products, though which are not their exact needs. So, this is very high time offering the personalized packages. Still, there many aspects such as price, brand, size and etc. can be considered for making real time and dynamic package based on individual user's preferences. In this paper, we propose a package building design framework based on the interest of the each consumer. The initial packages are made by incorporating the clickstream, purchase history, products rating and etc. as well as the contextual data (such as time, place and etc.) can be used to predict and recommend a more relevant number of packages. Later on, the early package has been changed by the final order during the different stages of purchase life cycle since in different steps customer mind may change. Our motivation to alleviate the obligatory buying the unnecessary products with a package as well as user friendly packages are offered to customers, which also help them to save browsing time to add products to the online shopping cart.

**Key words:** Personalized Packages Recommendation, Purchase Life Cycle, Predict Real-time Package, E-commerce Products bundle.

### 1. INTRODUCTION

Highlight E-commerce firms are relentlessly searching for better virtual decision making tools to increase sales. Though, it has been found that few recommendation systems recommend products to individual customers, but which are

not enough to attract the customers buying more items together. For example, a package is made manually by customer on Amazon website similarly on Last.fm and Netflix there are solutions according to users' desired [23]. More products might be offered together as a package to maximize the sales, though there are few bundle recommendation methods exist, but most of them do not work well in the real time. In many cases the current package recommendation systems do not reflect enough individual user's interest and behaviors. So, marketers should offer and recommend the products the way consumers think about the brand, price, package size and different attributes. Even if, they are struggling to understand the customers' mind in different times of the day, week, months and year even with their location which are described in the table 1. These facts should be considered to make a package. Since, naturally human expectation also vary over the time and location.

Nevertheless, this is the very right time to forecast the exact demand of the online customers. Usually, on online purchases the users are offered various choices by marketers than traditional shopping like more diverse, personalized package which are considered as important longing [11]. Thus, most of the online shops have huge numbers of products and people always do not have time to search according to need from the billions of products. In this competitive market, it needs to think more about customers' psychology and products should be offered accordingly. In this paper, we propose a building package design strategy using clickstream as well as others data of users' like purchase history, time, location and others contextual information.

Now-a-days bundling strategy is one of the techniques to boost the sale. One of the common and focused definition is that a bundle comprises of an assortment of products with features that mutually contribute to consumer service for preferred universal features [13]. Several of items are made together to create package, which is offered to consumers for diverse purpose like discount offer, new items sale, influence customers to buy and etc. That is why, personalized package could be the one of the convenient solution for customers, which helps them to buy products even without browsing.

Indeed, a few clicks are not the easy way for consumers to get access for diverse products, where they are guided to different items suggested by the shoppers' sites [11]. In reality, consumers want to buy multiple products as a package with a single click. The package is built by considering mix

products, discount, membership benefit, time, customer interest, and so on. In practical, the package cost and number of product should be as much as less. In our model, the total cost of the package and its size are determined by customers' previous history and current activities. Thus, single product is also sold on the market place so it is also necessary to package and unpackaged to ensure the single item is also available. Though, in the given strategy, the package may be changed until the final choice of the user. A mixed package of products are shown in Figure 1.

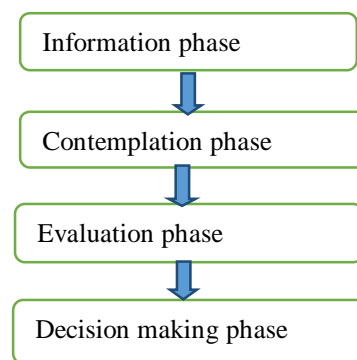


**Figure 1:** A mixed package of products

Commonly, personalized multiple packages choice are given to customer on online shopping, which is not available in the conventional shopping and it is considered expected and significant in practice [11]. Thus, customers' mind is changed during the online purchase life cycle, that is why, fixed package should not be offered to consumers. There are several phases of customers' purchasing process, which are commonly information, contemplation, evaluation, and decision making phases [21]. In the information search phase consumers inquiry the information buying the products but buyers also find out the customers' need to help them to make quick decision.

The aim of our research is to recommend package to users where the current recommendation techniques are being searched to predict customers' desires. But the most challenging thing is the lack of data of customers to predict package for them. The features of the products and the users' interests are matched to generate package. Sometimes, it is also happened that customer does not know their exact needs so, they can be helped to find their desired package. For each user, there is a function  $f$  and packages ( $p$ ) are offered to customers from the  $f(s)$ . The initial packages are built based on the prior knowledge of users then the packages are changed over the time based on current activities of consumers. Each package is built according to individual user's behaviors and there is also trade-off between package's features and single customer's interest. On the other hand, package is also modified during the purchase life cycle according to the real time response of the users. Thus, more than one package is recommended to consumers but the prioritization is applied to show the packages to the users. So, our model persuades the consumers to buy the packages. On the other hand, it shows more than one packages to customers to find their most relevant packages. In the package, the quantity of the products are changed dynamically based on individual customer's behaviors. The prior knowledge of the user, collaborative method and clickstream are used to predict the package size as well as cost. Thus, in most cases users are bound to buy addition product in a package. That is why, the

size of the package is not fixed in our framework which is change able.



**Figure 2:** Purchase Lifecycle (Buying decision process) [21]

Time-saving is one the strength of our model, because in the traditional systems user has to browse a lot of products from the menus. Whereas, in the traditional shopping users have to add products manually to shopping basket. Though, there are few exiting bundle or package recommendation method, but most of the techniques are not built based on personalized preference even the attributes are not taken as much as. In the marketing science perspective, multi-feature aspects on bundling are more advantageous but still not adequately captured the complexity of items bundling [14]. Many bundle recommendation systems are based on historical data and few of them have considered others factors like clickstream, basket items, and bundle size and so on. Still, there is an opportunity to provide package recommendation system by considering other factors which are not being considered widely like price, time, geographic location, home user, office user, sex, occasion, off day, holiday, religion, inventory turnover, new product, old product, season, age, brand and so on. Therefore, Product bundling remains a challenging task for designing and recommending to consumers in a personalized way since the buying intention and preference is not same for all consumers [11]. A Package can be built in different types, which can be influenced the consumers buying more products together.

In the current study, it has been found that most of the bundle prediction methods have been made to ponder consumer's preference but the techniques have been designed and develop based on co-purchase and collaborative method. The collaborative and content based bundle making techniques always do not fit for individual consumer. But the other features can be helped to meet the personalized user's preference. Our motivation to alleviate the obligatory to buy unnecessary products with packages and the given constrains of marketers. Moreover, our model will help the consumers not to buy additional or unnecessary items as well as it helps the customers to meet their maximum expectation. Indeed, each year online merchants expend more than billion dollars to find appropriate method to sell in bundles given various inducements [15].

In Our framework, the personalized packages are offered to customers in the real time during the different stage of purchase lifecycle as well as it helps to abate the cold start bundle problem. Since, current solutions are not enough to hold customers tightly in the every steps of purchase life cycle. Very few researches have been carried out in this specific field. So, it is the demand for the current data driven business to predict personalized offer. It will play an important role between buyer and seller and it will act as like virtual sells agent. Finally, real transaction data will be collected to evaluate the performance of the given package making technique performance and its advantages over the traditional packages well as discuss its' implementation approach.

## 2. LITERATURE REVIEW

In the present globe, E-commerce platform is a very prevalent marketplace because of its diversified offers to customers. On the other hand, the most facilities are that items are offered to customers in a different ways. Less number of researches have been done in the package building prediction and those given solutions are not enough to forecast customers' need. Even, the existing solutions do not hold the customers as much as during the purchase life cycle to persuade them for buying packages. So, still there is a chance to work on it to give solution according to consumers and merchants demand. Merchants are still fighting to comprehend the individual customer's attitude, offering items or package, before orders are made by them. Because of the behaviors of the customers are very significant to build the packages in the real time. One of the approaches is to perceive the online browsing behaviors of users by analyzing the network traffics [1]. It is very challenging, perplexing and difficult to know the behaviors of the online users. Till now, it is hardly identified the type of user by extracting profile data, because of each user does not receive same service [2]. On the other hand, users may not intending to provide information for self-identify into diverse users' groups [2]. Another difficult task to identify the behaviors of the new user. However, the framework also makes and offers the bundles, those who are new users. Where, the packages are made and offered by our framework for those who are new users. As we know that, the most common recommendation systems do not work well in all circumstances like new user and sparsity [3]. In the previous research, clickstream data are used for the mining of the web usage [4]. For analysis, in the prior researches just used different methods such as Markov Chain to discover the user's navigation path within a website [5]. Since, those methods are not efficient to take decision for complex environments, but those are considered the basic aspect of the user's behaviors. Though, there are many other methods such as clustering techniques, which uses similar clickstream to discover the similar groups' users [6].

Many items recommendation techniques were developed using clickstream data where association rule mining is used to build and improve the performing of the recommendation system, Kim et al. [7]. One of technique Kim et al. proposed to cluster the users and products using k-means to give highest preference [8]. As a result, this technique is efficient and it is decreases the computation time to compute buyer's preferences. In fact, customer's web browsing activities can be revealed by applying mining techniques on clickstream. In [12], the model has been proposed on packages to consider preference which is hard constraints and fixed score functions. In reality, this solid constraint always cannot be good for customers because their mind and buying ability is not same all over the years. In [24], this paper an interactive method has been proposed to discover the desired products. But which does not have considered the preference for the bundle even it is not well defined how to elicit the user's feedback .In [25], the authors inquired about the cost-effective travel package the way it can be recommended and customers' preferences were adopted. Cost is always not a prime factor to buy a package, but others factors can be considered to understand the preferences of users.

Recommender system is like a virtual sales person to the marketers, but it does not provide customer's feedback to the sellers [9]. Item bundling is most essential for promotional strategy, according to economic and marketing studies even which is discussed very significantly [22]. One of the very traditional methods to increase the conversions, which are called the recommendation algorithms, where customers' interest are stored and used to generate the list of the items to be recommended [10]. This conventional approach just gives the option to the customers, but it does not highly persuade the customers to buy. That is why, it is clear that the current recommendation systems are not ample to generate offers in well-timed for online consumers. Most often, the package is made based on given constraint, where the minimum number of products is mandatory to buy as a bundle.

It has been found that, the dissimilar products bundling could be cost-effective with its supplements and alternatives impact on it [16]. Composite recommendation was defined as a recommending a group of items which meet predefined user's needs based on cost [17]. The greedy algorithm was developed to build top numbers of recommendations for maximizing the total value of the items in the package for the customers [17]. Each of the separate product's value is significant to customers [18]. The motive of the consumers purchase depends on the pricing strategies of single product as well as its total in the bundle [19]. It has been also found that, the conventional package purchase intention of consumers is limited, thus, most of the time it is a burden and more than the consumers' true need regarding the quantity [20].

### 3. PRODUCT PACKAGE

One of the common tradition, merchants want to sell more products together to increase profits in a short time. To sell more than one product together it is called package or bundle. Here, it is considered as a package to define selling two or more products as a single product. Usually, users find their need on the online market and add a single product to a shopping basket. But, now consumers can add more products to a basket as a package with a single click. So, in a package customers can buy collections of products together without time consuming on the online market. There may be others strategy of packages selling, but we are going to propose personalized package building framework, and which is changed during the purchase life cycle. The framework elicits the preferences of customers by using their activities as a feedback. More than one package is presented to consumers using their previous history and current knowledge to serve based on personalized need. Typically, there are two types of packages, one is pure another one is mix package. In a pure package, more than one same product is sold but in mix package at least two or more different types of products are sold together. Therefore, the mix bundle technique is used in the given framework. In the table 1 and table 2 shows the elements which can be considered making package.

**Table 1:** Package Elements

Package elements	Description of the package elements
Price	Since, each customer's buying ability not same, so, this implies the total price of the package
Size	How many products should be comprised in a package, the size of the package depends on the individual customer's needs.
Brand	Same product has different brand and it's reflected the personality of the customer. Products' brand may be varied based on personalized package.

**Table 2:** Context Data

Context Data	Description of Context Data
Time	Sometimes, customers' buying behaviors are varied in different time like morning, evening, night, working day, off day, summer, autumn and so on.
Festival	Users buy particular products in different social, cultural and religious occasions
Place	A consumer's package can be different based on location like Washington and Dhaka and etc.
Psychology	It reflects the preference of the customers like color, hobby and so on.
Feedback	During the user's online shopping when they do activities in each phase of the purchase life cycle.

In the above tables 1 and 2 things (elements) have been mentioned, which can be considered to build the package. If a package is made using maximum elements, it would be the best fit for a single customer.

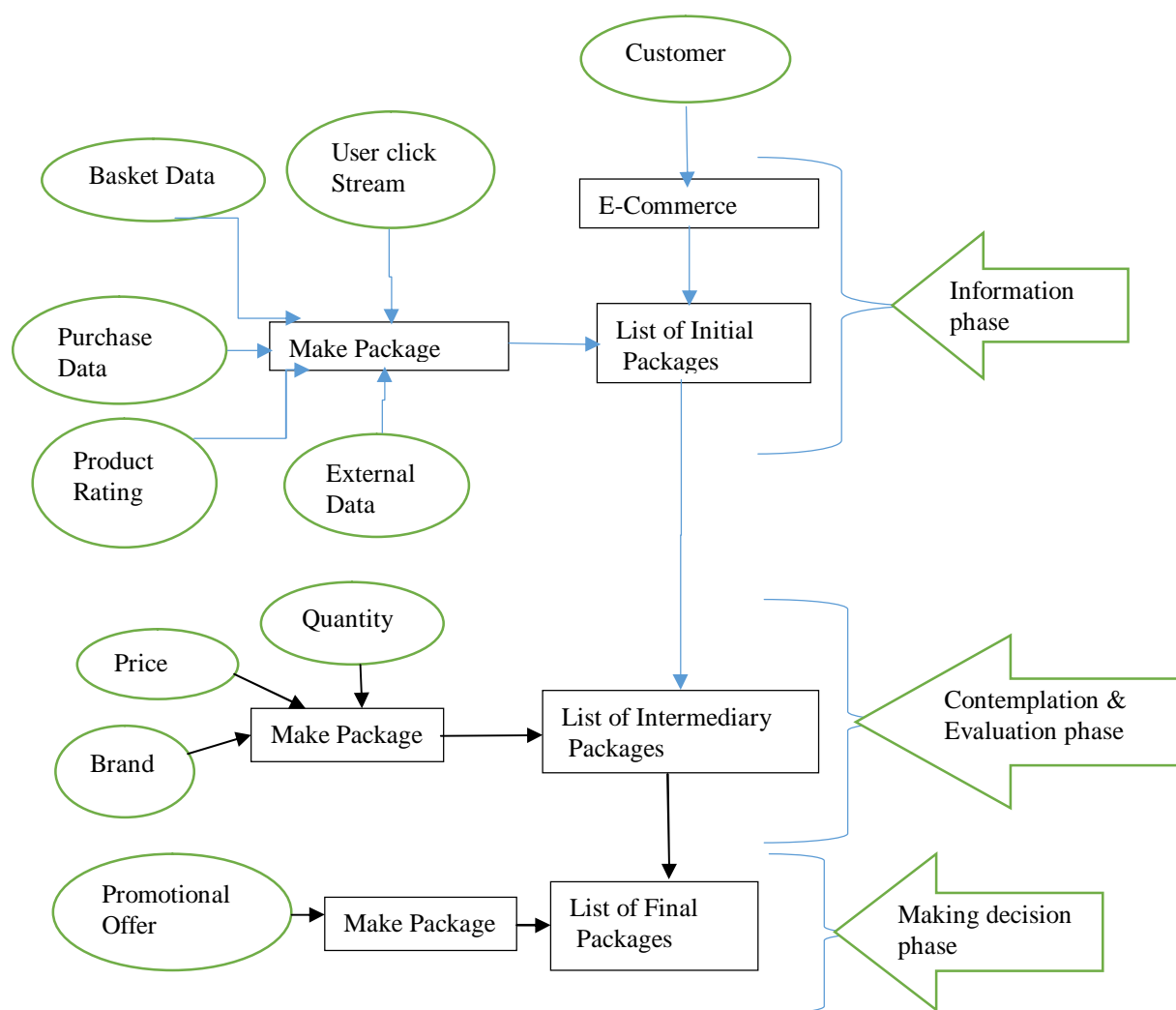
### 4. PROBLEM STATEMENT

Let  $I$  be the number of products,  $U$  be the group of consumers,  $P$  be the set of packages, and  $F$  be the set of item features, where a product has a multiple features which are significant import to find out personalized preference. Suppose  $B$  be the basket data  $B=\{b_1, b_2, \dots, b_n\}$  where  $n$  is the number of basket data,  $A$  be the set of activities on the shopping site mostly user behaviors  $A=\{a_1, a_2, a_3, \dots, a_Q\}$  where  $Q$  is the number of activities,  $C$  be the set of context,  $C=\{c_1, c_2, \dots, C_r\}$  where  $r$  is the context types, like a location, time, history and etc.

Initially number of top packages  $X$ , which can be generated for an individual customer, where  $X$  is any number but it is changed dynamically and varies from customer to customer. Besides, packages can be ranked and the higher the package rank the most preferable to customer. Still, there is no universal standard of package size and price, though most of the time these defined by the shop owner. Most often, the customer does not get the exact information about the package benefit that is why they intend to buy a single product than the package. Suppose, there are products  $I_1, I_2, I_3, \dots, I_n$ , where  $n$  is any number of product and Packages are  $P_1, P_2, P_3, \dots, P_n$  and consumers are  $U_1, U_2, U_3, \dots, U_n$ . For example for user  $U_2$ , there are package  $P_1, P_3$ , and  $P_5$ , Package  $P_1$  reflects the highest preference of the consumer  $U_1$  and accordingly  $P_3$  and  $P_5$ . On the other hand, top packages like  $P_1$  and  $P_5$  and etc.

Since, the packages are being based on users' choices. So, customer's preferences are educed according to the various attributes like location, size, time, price and etc.  $A$  {location, price, brand, size, time, product rating, psychology, occasion, package types}. The attributes are mostly identified using the activities of the clickstream, purchase history, basket data, and etc. These attributes may be changed during the phases of the purchase life cycle. Very often, the attributes of the products are given so, at first, choose the products which are closest to customer's preferences. Secondly, the packages are generated from identified products based on the desires of the customer. Finally, the packages may be changed based on the current behaviors of the customer.

$P_i=\{I_1, I_2, \dots, I_n\}$ , where  $n$  is the any number and  $i=1, 2, 3, \dots$  that means  $i$  is any number, suppose, a package contains a number of items based on user interest, on the other hand more than one package can be for a customer. So, we can write  $I_1, I_2, \dots, I_n$   $P_i$ , if  $i=1$  then the number of products like  $I_1, I_2$  and more products are in the package  $P_1$ .



**Figure 3:** Package building strategy based on real time purchase life cycle

With the notations and interpretations, the problem is addressed in this research is formally narrated as: taking historical data of a user, clickstreams of purchase lifecycle and find out other factors as an input like context data to build dynamic and personalized packages prediction framework for the customers.

## 5. REAL TIME PURCHASE LIFE CYCLE BASED PACKAGE BUILDING STRATEGY

In the following above 3 the framework has been depicted with details. As far, we did not find a well presented package, making framework, which is based on the users' real time

That activities and changeable in the every step of the purchase life cycle. We would like to conclude this paper with the package building strategy in the different steps of buying lifecycle. What do the consumers think in each step of the purchase life cycle? This is our intention to find out and it is one of our given framework strategy to elicit the customer's preference and to give them the expected package according

to their desire. In this mode, the customers' choices are elicited in the information, contemplation, evaluation and decision making phases. First of all, in the information phase, when customers enter into the merchant's website they are given the list of packages based on their previous history. After that, when customers are in the contemplation and evaluation phase, again they are given the list of packages, which are more updated than the previous package list because these are modified by using the feedback on information phase. And finally, customers are given the final list of packages, which are made according to their feedback of previous phase and the existing knowledge of customers. In the figure 2 represent the package building strategy based on real time activities, previous history and context data.

**Package information phase:** This is the first and initial phase for consumers, when they first time visit to the website, the list of packages are offered to them. These lists of packages are built by using basket and purchase data, user click stream, product rating, and external data (e.g. social media and other source of data). On the other hand, if the customers are new then without purchase data, the rest of the

data can be collected as a result it might be helped to solve the cold start problem. In this way, the packages would be more personalized to consumers. Whereas, most of the traditional bundling methods do not consider all types of aspects. So, as much as the users' behavior and external data can be used to offer consumers' wish packages.

**Contemplation and evaluation phase:** In this step, customers compare the individual item and package and its benefit as well as they consider the price, brand and product's attributes. Very often, customers leave from this phase without ensuring the order, even though products are added to the basket. Another, the intention of this framework is to hold the customers tightly in the every phase of the customer decision and persuade them to buy the packages. In this intermediary level, packages are modified based on the more behavioral feedback of user on the website, which he/she does on the information phase.

**Making decision phase:** The last phase of the purchase life cycle, how to finally influence the customers to ensure the final order before leaving the website? In this final stage, promotional offers, customer return value, package size, item quantity are added to build packages, in spite of these previous phase's feedbacks is also included to make the final packages

## 6. CONCLUSION

Now-a-days it is a quite common that most of the online consumers buy enormous of items from the online marketplace, where some of them offer more than millions of products to consumers and that is most often very tough for the customers to find the required items to add on the shopping basket. Though, there are conventional recommendation systems, which usually recommend single products. On the other hand, online vendors are struggling to solve the above mentioned problem to predict consumers' needs and recommend products as a package, which is helping to increase the sale. First of all, the conventional solutions are not adequate to impart dynamic and packages to online consumers even they are forced to buy more products, which are not their actual needs. Secondly, it has found that packages are made by marketers as a result the user does not get maximum benefit from it. On the other hand, the initial package is not changed dynamically during the online purchase life cycle. Finally, it has been found that as much as context data (e.g. time, location, season and etc.) is not considered to find the customers' preference for building the package.

In this mentioned framework, the package building and implementation guideline have showed to discover the customers' preference to make personalized packages. Firstly, the existing data like basket, clickstream, purchase history, product rating, contextual and external factors are incorporated to comprise the initial package in the

information phase of the purchase lifecycle. In the second phase of the purchase life cycle, the packages are modified according to feedback of the previous phase and current behaviors. Finally, in the decision making phase, the promotional offer may be considered with feedback of the previous phases.

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