



## Using RFM approach with PBL to course design

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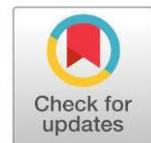
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**Abstract:** Based on Problem-Based Learning (PBL) concept, this study creates an advertising script by conducting RFM (recency, frequency, monetary) approach from the data analysis in customer relationship management (CRM) course. In PBL process, the students themselves should use RFM method to make segment from the customer database of service industries and find out the characteristics of target segment based on the demographic variables and according to these traits to form their advertising scripts. Through finding the highest value of segment as the target customer, they should focus on the characteristic of their choice target and create an advertising script to attract this segment by their traits. These processes of steps can provide the course design of CRM or advertising project to make creation from customer targeting.

**Keywords:** attainment gap; sex differences; learning strategies; teaching styles; academic behavior; secondary school students.

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### INTRODUCTION

Problem-Based Learning (PBL) has been widely applied to a course design methodology for teaching for many years. There is much research using it for engineering education application (Chen et al., 2021), improving learning quality (Nurtanto et al., 2019; Cîmpean & Bocoş, 2022), exploring student engagement in the course (Naji et al., 2020), measuring its effectiveness between traditional teaching skill (Strobel & van Barneveld, 2009).

Problem -Based Learning (PBL) is defined as unstructured problems that are presented as unsolved, so students come up with multiple ideas not only about the cause of the problem but also about how to solve it (Barrow, 2002; Strobel & van Barneveld, 2009; Zhang & Hwang, 2022). PBL focuses on students learning environment in the form of problem-solving with analytical and data skills (Nurtanto et al., 2019). Thus, it is a student-centered approach in which students derive the critical issues of the problems they face, and teachers act as facilitators and tutors. In other words, PBL is aligned with professional or "real world" practice (Barrow, 2002; Strobel & van Barneveld, 2009; Sihombing & Iswara, 2022).

Unlike past disciplines that used PBL in their courses, the adoption of PBL was usually at a practical level, such as medicine or nursing. This study applies the PBL concept as a process in business management discipline to the customer relationship management (CRM) course designing. In this course, the



implementation of the PBL framework is proposed. To follow steps by steps in this framework, students can learn not only the theory of CRM but also how to conduct a customer database analysis and finally procedure the outcome of an advertising scrip.

In the PBL framework, a RFM (recency, frequency, monetary) approach which is most applied in CRM analysis is used. Then, based on the results of RFM segment of service industries, students themselves should create advertising scripts to improve the customer value form the chosen target.

The article is constructed as, firstly, the literature review of RFM and advertising design are demonstrated. Secondly, the detail of the course design in this paper will be descript. It includes the purpose of this course, the multiple steps of PBL, and the student's information. Finally, the results of RFM analysis and advertising scripts that students create are demonstrated. The conclusion is made for future allocation.

### **The Literature Review**

This research is use PBL approach in CRM course for students to make RFM analysis application and based on the results of RFM to produce advertising scripts. In the literature review, the PBL approach and RFM concept are introduced.

### **The Previous Research of PBL**

[Strobel & van Barneveld \(2009\)](#) conduct meta-analyses to compare different conceptualizations of learning and demonstrate how to measure them. They identify common and generalizable findings to the effectiveness of PBL and find that PBL is superior when it comes to skill development and satisfaction of students and teachers. However, the results also show that traditional approaches are more effective for short-term retention as measured by standardized board exams.

[Nurtanto et al. \(2019\)](#) use the PBL method to apply literacy campaigns and character values to improve the quality of life and career skills in gasoline engine course learning. They conduct the Elliot action model in two classroom action cycles. They find that the literacy movement was observed as successfully implemented with an increase and inducing character values improves student behavior. And strengthening the competency of students in the gasoline motorbike curriculum is also fined.

[Naji et al. \(2020\)](#) explored forms of student engagement in PBL settings, drawing on empirical data of observations and group interviews with project teams in different PBL undergraduate civil engineering courses at Qatar University. They find that PBL types and their appropriateness to the nature of the course, students' prior experiences with PBL, and team dynamics will influence student engagement in a project team. The patterns of engagement as autonomy and connection have significant student engagement in a PBL setting. But relational and emotional engagement has been positive yet slight for student engagement in a PBL setting.

[Chen et al. \(2021\)](#) illustrates the variety of PBL implementation at various levels, which includes the project level, the course and cross-course level, and so on. The author explores the various levels to discuss the challenges and practice of PBL, which is currently reported and being implemented. Across these levels,

similar challenges are demonstrated for teachers and students at the individual level, as well as at the institutional level and the cultural level. They also provide directions for future research of engineering education researchers, and suggestions for engineering faculty and staff are proposed to optimize PBL curriculum design and inform future PBL implementation.

This study uses PBL method to design CRM course. It provides a framework of PBL implementation as a process to help students steps by steps to learn CRM application.

### **The RFM Concept**

RFM stands for recency, frequency, and monetary value. These three factors are defined (Kumar & Reinartz, 2018) as:

1. Recency: A measure of how long it has been since a customer last placed an order with the company.
2. Frequency: A measure of how often a customer orders from the company in a certain defined period.
3. Monetary value: The amount that a customer spends on an average transaction.

RFM technique utilizes these three metrics to evaluate customer behavior and value and is often used in practice (Kumar & Reinartz, 2018), especially in customer relationship management (CRM). It can help to distinguish high contribution customers in the customer segment. Such as Heldt et al. (2021) integrate the product and customer marketing perspectives and propose a new approach to predict customer value based on an RFM per product model (RFM/P).

The process of the traditional RFM analysis approach is as follows. Firstly, the customer data is sorted in descending order based on the most recent purchase date criterion. The earliest purchasers are listed on the top, and the oldest are listed at the bottom. The sorted data are further divided into five groups of equal size (20% in each group). The top-most group is assigned a recency code of 5, the next group is assigned a code of 4, and so on, until the bottom-most group is assigned a code of 1 (Kumar & Reinartz, 2018).

Secondly, the frequency coding process is the same as the recency coding process discussed. However, to sort the group of customers based on the frequency metric, we need to know the average number of purchases made by a customer per month. The choice of the appropriate period depends on the usual frequency of purchases. In this case, customers with the highest number of purchases per month are grouped at the top, while those with a lower number of purchases per month are listed below. Here again, the sorted list is grouped into five quintiles. Those in the top are assigned a code of 5, and those at the bottom a code of 1 (Kumar & Reinartz, 2018).

Thirdly, the monetary value coding process is precisely the same as the recency and frequency coding processes but sorts the group of customers based on the monetary value metric. The index can be the average of monetary spending or the total amount of monetary. As with recency and frequency, the customer data are sorted, grouped, and coded 5 to 1 (Kumar & Reinartz, 2018).

Finally, there are 5\*5\*5 groups (total segments are 125groups). The numbers of group sorting can be decided by different industries and depending on different situations such as the sample size of database or

the budget of marketing ([Abbasimehr & Shabani, 2021](#); [Heldt et al., 2021](#); [Rahimac et al., 2021](#)). This paper is demonstrated different numbers of groups segmented by the database and the attribution of industry. The detail is describing in the next section.

The RFM analysis is most used in teaching students about CRM applications. Thus, this study uses RFM as an analysis tool to help students learn how to make customer segments by different CRM value.

## METHOD

### The Process of Course Design

This research based on PBL concept to conduct RFM approach creating an advertising script from the data analysis of RFM in customer relationship management (CRM) course. The RFM analysis is the popular approach and widely used to measure customer value which is an important main concept of CRM. Different from other course of CRM, which pay attention on the usage of technical tool teaching such as the CRM information computing software, the course design of this research first introduces basic knowledge of CRM including the marketing elements of service industries and RFM segment for capture high customer value targets.

Then, as the PBL, the students are asked to use RFM method to make segment from the customer database of service industries. In this stage, the CRM technique can be made practice by students themselves. According to the results of RFM segment, students can compare different segments from their customer values and choice one segment for their marketing target. An advertising scripts creation will induce to let students themselves make brain stoning of forming ideals to construct the advertising plots. The story of advertising includes the video and audio parts and must be fitted with the target segment that is analyzed from RFM.

Different from other advertising creating course ([Rojprasert et al., 2020](#)), the scripts creation of this course is a part which induced from PBL of the RFM results. The students themselves should find out the characteristics of target segment based on the demographic variables and according to these traits to form their advertising scripts. The design and implementation of PBL was completed in multiple steps ([Figure 1](#)).

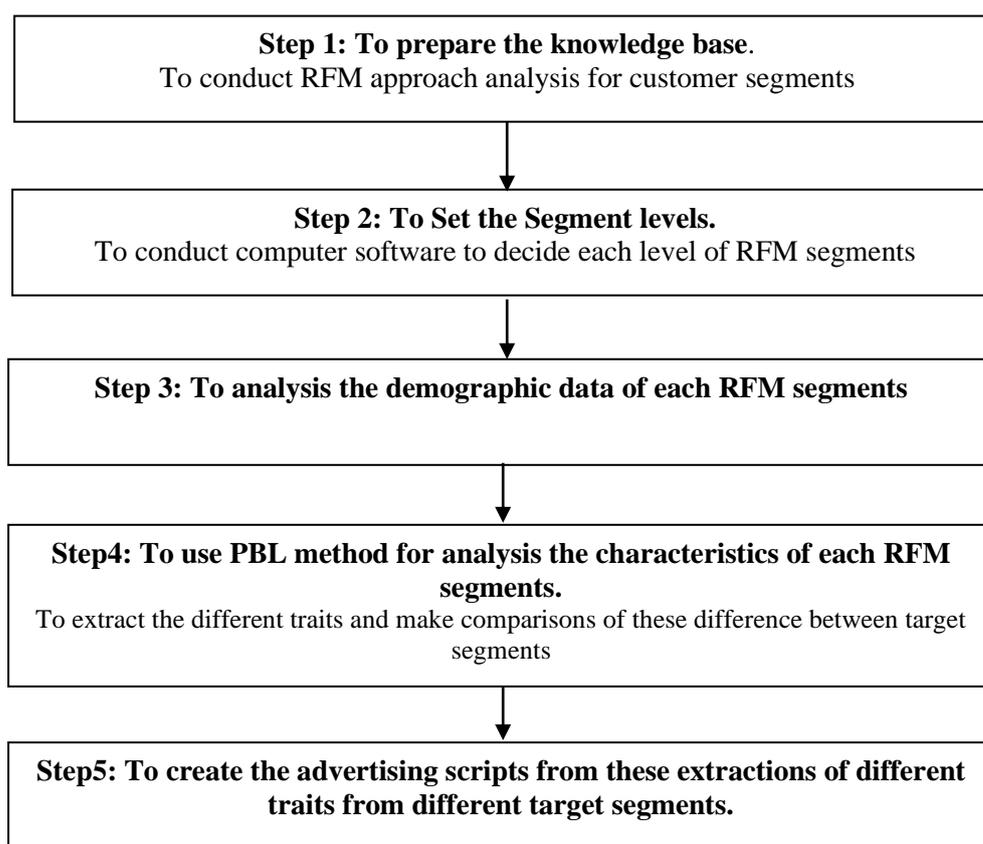


Fig. 1 The design and implementation of PBL steps

### The Course

The CRM course is an option course for second years college students in the department of Advertising& Public Relations. Thus, the outcome of PBL is to create the scripts of advertising from RFM segmentation. There are 21 females and 8 males into seven groups as a team work to conduct the RFM method of customer segmentation and form the advertising scripts.

In the first third semester, students learn about the basic theory of CRM which includes the customer value calculation, how to keep good relationships with customer. In the first topic, students should know about RFM approach, and the segmentation causes are used to demonstrated by a customer database of service industries.

In the second topic, the service marketing is induced to help students learning about the impact factors during the purchase process divining into pre-purchase, service encounter and pos-purchase. In the pre-purchase stage, the expectation that forms from customer will influence the adequate service and desire service and the tolerance zone between these two levels can construct different relationships of customer and company. In the encounter service stage, the different service models such as theatrical metaphor are introduced. The students also learn about impact variables of service encounters. In the pos-purchas stage, the service perceptions are introduced includes service quality that service company should provide. For

example, the reliability which is ability to perform the promised service dependably and accurately; the assurance which is the knowledge and courtesy of employees and their ability to inspire trust and confidence; tangibles which is physical facilities, equipment, and appearance of personnel; empathy, which is caring, individualized attention the firm provides its customer; responsiveness which is the willingness to help customers and provide prompt service. The students can base on this theory learning as a material to create the advertising script.

In the middle third of the semester, students start to use RFM approach to segment data according to the order of the recency, frequency and monetary number of transactions respectively. Each customer will be assigned to one of the 2\*2\*2 groups such as 111, 211, 121, ...,222, based on her respective RFM code. An overview of the RFM procedure is given in [Figure 2](#).

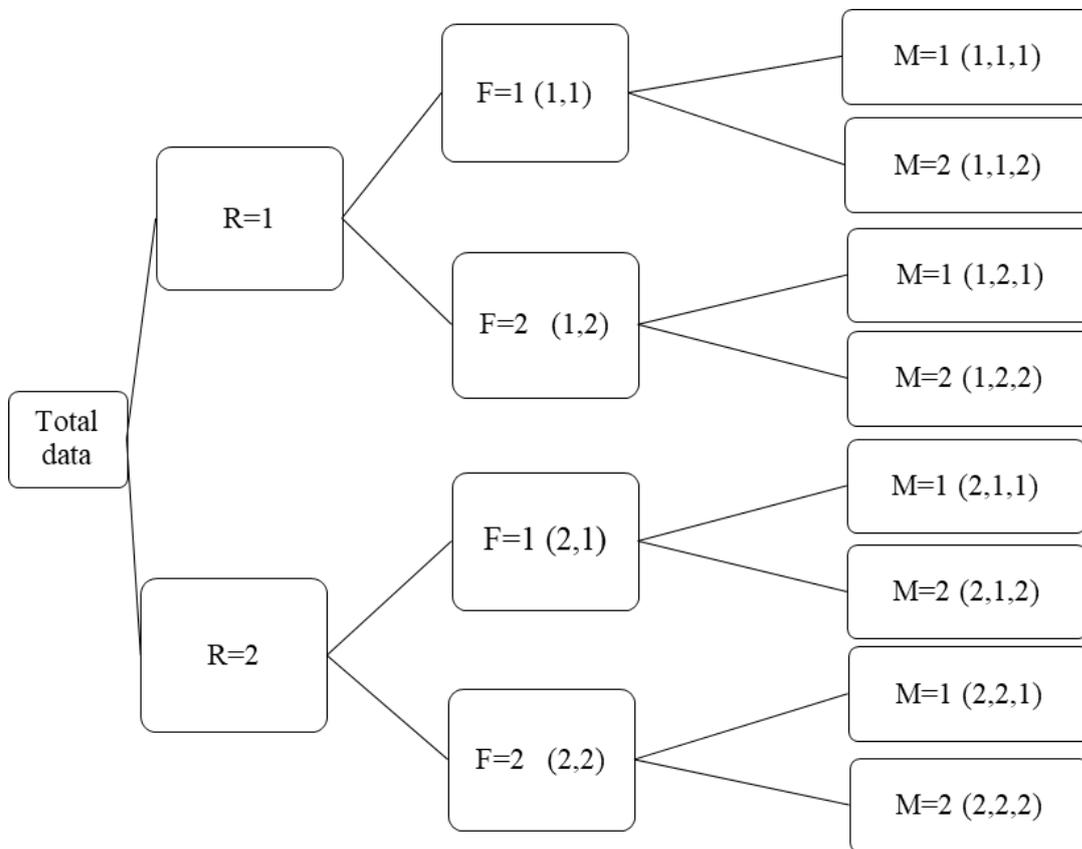


Fig. 2. The analysis framework of RMF

In figure 2, (1,1,1) means the customer purchase recency is remark as 1 (R=1), purchase frequency is remark as (F=1) and purchase monetary is remark as (M=1). The empirical data from fashion industry is used to students for RFM segment practice. The empirical data firstly will be divided into two groups of people equally according to the recency of the purchase date. The people in the group of R=2 is more recent than which of R=1. Then, in the two groups of R=1 and R=2, they are divided into two groups respectively according to purchase frequency (F). The people in the group of F=2 is more frequency than which of F=1 in

the same R group. Finally, each F group is divided into two groups equally again according to purchase monetary (M). Thus, the group (1,1,1) which means R=1, F=1, M=1 is longer purchase recency, less purchase frequency and less monetary spending than group (2,2,2) which is R=2, F=2, M=2.

In the remaining third of the semester, students find the characteristics of segment group and choose one group for their target customers. They should figure out the problem of the target segment in service industries. And according to the results of RFM segment, they create the advertising scripts in which the circumstance of service (expectation, service encounter, and service perception) and solution of solving the problem should be demonstrated.

## RESULTS AND DISCUSSION

### A Cause of Fast Fashion Industry

It demonstrates the results that a group of students use the RFM approach with PBL method in the case study of fast fashion industry. It is followed the steps that this paper proposed from step 1 to step 5.

#### Step 1. To Prepare the Knowledge Base

The empirical data is obtained from a fashion industry to use for the practice of RFM segment. The sample size is 5236. There are 2122 (40.5%) male and 3114 (59.5%) females. For the education level, there are 969 (18.5%) bachelor's degree, 247 graduated degree (4.7%), 111 (2.1%) Ph.D. degree, 603 (11.5%) college degree, 1406 (26.9%) high school degree and 1900 (36%) lower than high school degree.

For the purpose of this paper is to use RFM framework to portray the purchase behavior in different service industries. The transaction data in this data base includes the last purchase date, the last consumption amount, the highest amount of monetary spending, the average amount of monetary spending, and the frequency during the transactions.

#### Step 2. To Set the Segment Levels

For the fashion industry, this database includes the purchase behavior of a certain brand of fast fashion chain store. It is also segment total data into two groups by R which is defined as the days since last transaction. According to this industry, the first hierarchy "R" is 18 days. Frequency is number of transactions in the past month. It is used four times as standard. Monetary is the total monetary amount of transactions in the past month. The threshold levels of eight groups are less or more than 3537, 2498, 1717, 1127 respectively.

To conduct computer software to decide each level of RFM segments, the results of RFM segment in fast fashion chain store is demonstrated as [Figure 3](#).

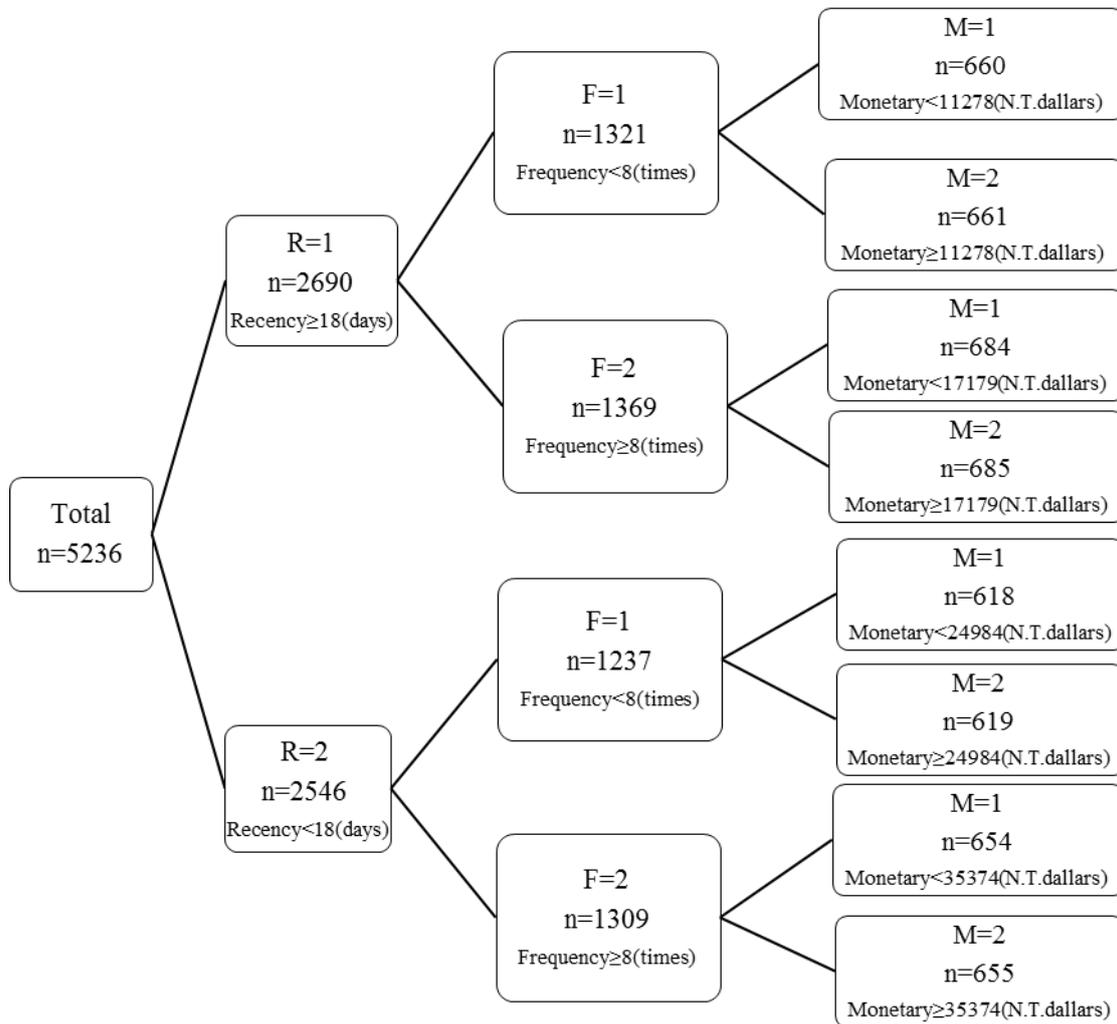


Fig 3. The analysis results of RFM in fashion industry

### Step 3. To Analysis the Demographic Data of Each RFM

After making RFM segmentation, it is compared the group of (1,1,1), (2,2,1), and (2,2,2) for the average consumption amount per transaction, the maximum consumption amount of transaction, the total consumption amount in the past month and the transaction frequency. According to the segment in Figure 3, The people in group (1,1,1) are R =1, F=1 and M=1 which demonstrates the days since last transaction in the past month (recency) is larger or equal to 18 days (recency  $\geq 18$ ), number of transactions (frequency) is smaller than 8 times (frequency=8) and the monetary spending in total amount of transactions (monetary) is smaller than 11278 NT. dollars (monetary < 11278). The people in group (2,2,1) are R =2, F=2 and M=1 which demonstrates the days since last transaction in the past month (recency) is less than 18 days (recency < 18), number of transactions (frequency) is larger or equal than 8 times (frequency  $\geq 8$ ) and the monetary spending in total amount of transactions (monetary) is smaller than 35374 NT. dollars

(monetary<35374). The people in group (2,2,2) are R =2, F=2 and M=2 which demonstrates the days since last transaction in the past month (recency) is less than 18 days (recency<18), number of transactions (frequency) is larger and equal than 8 times (frequency ≥ 8) and the monetary spending in total amount of transactions (monetary) is larger or equal than 35374 NT dollars (monetary ≥ 35374).

For comparing (2,2,2) and (2,2,1), the mean of average consumption amount per transaction in the past month of (2,2,2) is 1445.48 N.T. dollars which is 1.5 times higher than 999.46 N.T. dollars in group (2,2,1). For the mean of transaction frequency, group (2,2,2) is 1.07 times and group (2,2,1) are 3.16 times. It can be seen that the customers in (2,2,2) who have a high single consumption amount but low consumption frequency and the customers in (2,2,1) who have higher transaction frequency but low single consumption amount.

For comparing (1,1,1) and (2,2,1), the mean of maximum consumption amount of group (1,1,1) is 6098.3 N.T. dollars and which of (2,2,1) is 5605.2 N.T. dollars. There is little difference between these two groups. It is also little different for the mean of transaction frequency in group (1,1,1) and (2,2,1). Group (1,1,1) is 2.12 times and (2,2,1) is 3.16 times. But the total consumption amount and the mean of average consumption amount per transaction, (1,1,1) are both about twice as much as (2,2,1). The mean of total consumption amount of (1,1,1) is 18035 N.T. dollars and which of (2,2,1) is 9384 N.T. dollars. The mean of average consumption amount per transaction of (1,1,1) is 5823 N.T. dollars and which of (2,2,1) is 999.46 N.T. dollars.

To sum up, it can be seen that the maximum spending power and consumption frequency of the two groups of customers (2,2,1) and (1,1,1) are very close, while the amount of each consumption of (1,1,1) is significantly higher (Table 1).

Table 1. The detail information of group (1,1,1), (2,2,1), and (2,2,2)

Group	(1,1,1)	(2,2,1)	(2,2,2)
RFM score	R=1, F=1, M=1	R=2, F=2, M=1	R=2, F=2, M=2
Recency (The days since last transaction)	≥ 18 (days)	<18 (days)	<18 (days)
Frequency (Number of transactions in the past month)	= 8 (times)	≥ 8 (times)	≥ 8 (times)
Monetary (The total monetary amount of transactions in the past month)	<11278 (N.T. dallars)	<35374 (N.T. dallars)	≥ 35374 (N.T. dallars)
mean of average consumption amount per transaction	5823 (N.T. dollars)	999.46 (N.T. dollars)	1445.48 (N.T. dollars)
mean of transaction frequency	2.12 (times)	3.16 (times)	1.07 (times)
mean of maximum consumption amount	6098.3 (N.T. dollars)	5605.2 (N.T. dollars)	
mean of total consumption amount	18035 (N.T. dollars)	9384 (N.T. dollars)	

**Step 4. To Use PBL Method for Analysis the Characteristics of Each RFM Segments**

Group (1,1,1) is choice to become the target consumer. Because this group of consumers can provide the largest consumption amount, the highest consumption frequency, and the number of recent consumption days. In the field of fast fashion, these are very important indicators. There are a total of 655 people in this group. The number of the days since last transaction are between 2-17 days. The number of transactions in the past month is between 2-6 times. The total amount of transactions in the past month is between 3538-30353 N.T. dollars.

**Step 5. To Create the Advertising Scripts from These Extractions of Different Traits from Different Target Segments**

Thus, based on characteristics of target consumers with RFM segment, the creation of advertising scrip is demonstrated in [Table 2](#).

Table 2. The advertising script of fashion brand

	<b>Video</b>	<b>Audio</b>	
First act	A woman walks confidently to the fashion store for outside to inside.	*Audio: a fashionable BGM, clop-clop (the sound of high heels).	2
Second act	Walking confidently in the fashion store and passing by dazzling and numerous clothing.	*Audio: a fashionable BGM, clop-clop (the sound of high heels).	2
Third act	Choosing and taking a few clothing and walking toward fitting room.	*Audio: a fashionable BGM.	3
Fourth act	Keeping going clothing shelf and fitting room back and forth. (Feeling a little impatience.)	*Audio: a fashionable BGM.	3
Fifth act	Word Card: "Now, you won't waste your time any longer".	*Audio: a fashionable BGM.	1
Sixth act	Walking confidently in the fashion store and passing to another dazzling and numerous clothing.	*Audio: a fashionable BGM.	2
Seventh act	Staring to click the digital signage to choose the clothing that she wants to have a fitting trial.	*Audio: a fashionable BGM.	4
Eighth act	Having a fitting trial in front of the digital signage and striking many kinds of pose like model.	*Audio: a fashionable BGM.	3
Ninth act	After the fitting trial, clicking the digital signage to choose those lists which are satisfied. (Having a relaxed mood).	*Audio: a fashionable BGM.	3
Tenth act	Carrying lots of paper bags filled with purchase and walking out of the fashion store.	*Audio: a fashionable BGM.	2
Eleventh act	Blurring the scene and the logo of the fashion store appears.	*Audio: a fashionable BGM.	2

## CONCLUSION

This paper uses RFM approach with PLM method to design the CRM course. The contribution of the research is combining the quantitative attribute and qualitative /creating attribute in the teaching approach. The students not only learn about the core technical knowledge, RFM, in the CRM but also conduct this approach to analyze a real customer database by themselves. Through finding the highest value of segment as the target customer, they should focus on the characteristic of their choice target and create an advertising script to attract this segment by their traits. It is found that students follow the framework of PBL is more easily to learn CRM theory and make it application in marketing. These processes of steps can provide the course design of CRM or advertising project to make creation from customer targeting.

In the future, other method such as survey can be used to explore the psychological variables as an impact factor for customer segmentation. Beside to the advertising script creation as the outcome of PBL, other output can be suggested to connect the RFM techniques with PBL. For example, research can consider a teamwork task project as the outcome. Finally, this framework of course design can be application for other kind of course.

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