

# Customer Relationship Management for Product Development Process using Pearson Correlation Coefficient with Data Mining Techniques

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**Abstract:** The Pearson correlation coefficient based on the customer relationship clearly illustrate to the product development process. It developed in an association from the customer relationship management process. The CRM should be implemented to the Pearson correlation algorithm. In an existing system is used to implement for a customer association management in an organization process implement for feature enhancement for 60% to 70%. The proposed systems followed by an implement the techniques of organization, categorization, cluster, Forecasting, degeneration, chain detection, revelation using data mining concepts of data sets in an organization. In this paper, we develop a Pearson correlation coefficient based data mining in customer relationship management, for mining large datasets in an organization, the results should be perfect(90% to 95%), which the companies having a large number of datasets, and also the association should satisfy a customer needs.

**Keywords:** Customer relationship management, Classification, Clustering, Forecasting, Pearson Correlation coefficient based data mining.

## 1. INTRODUCTION

**Data mining** the analysis step of the "Knowledge Discovery in Databases" process, or (KDD), is the process that challenges to determine outline in large data sets. They make use of methods at the relationship of reproduction intelligence, machine learning, statistics, and database systems. It absorb database and data management aspects, data preprocessing, "model" and inference thought, interestingness metrics, complexity reflection, post-processing of discover structures, visualization, and online updating. The actual data mining task is the automatic or semi-automatic analysis of a large quantities of the data to extract previously unknown interesting patterns such as groups of the data records (cluster analysis), unusual records (anomaly detection) and confidence (association rule mining). This usually involves using database techniques such as spatial indexes [3] [4].

A customer is not just someone who makes payment for a product or service, in the case of not-for-profit, organizations they can be the recipient of charity or the provider of a payment. It is necessary to the every organization needs to look at how it manages relationships with its customers for the best long term interests of the organization. CRM software is designed with help of the organization manage these relationships to achieve the best possible outcomes. Some of these specific parts of CRM may be appropriate to others may not, but the overall concept of improving the manner [5].

The main focus on CRM project should be benefit it will produce for the customer and the business. The first thing that should be looked at is *what* is being done now and then working out *what* should be done in the future to improve the way works with the customers. CRM is fundamentally important to all business. Now the CRM took part in all the major parts of the [5] business world, like sales, administration, marketing, purchase, data exchange, and service product delivery.

## 2. Associated Work

**Data Mining** is a powerful technology for recognizing patterns within data. It has been applied CRM to solve various problems. For example, it has been improved a customer compliant management classification using linguistic style features as predictors. The customer relationship between the combining management and data mining for marketing usingby means ofwith data mining to analysis for marketing on attributes of customer relationship and forecast customer consistency using internal transaction data base [6].

### 2.1 Techniques of Data Mining



There are following the data mining techniques contains

1. Association Rule for Data Mining
2. Collection of Classification
3. Clustering the Data Items
4. Forecasting Process

### 2.1.1 Association Rule for Data Mining

The association rule is used to overcome the business problems a customer relationship used do to the CRM is used to reduction to the problem for business. For example, the customer needs to develop the product and get the credit each transaction which forms a worthy platform for effective making and decisions for “records” customer relationship management. The performance of the integration approach is also compared with a similar approach which uses just relevance in its information extraction process [3][7].

### 2.1.2 Collection of Classification

The classification a collection of dividing the number of items that makes a collection of products for customer relationship. The classification is used to customer segmentation between the business analysis and many other applications. For example, the customer identifies then improves the product quality then improve the customer relationship [3][7][6]. In the organization problems also double or multicast goal. For example, categorize the problem using algorithm based to compare the feature enhancement to decrees the problems.

### 2.1.3 Clustering the Data Items

Clustering can be considered the most important unsupervised learning problems; so as every other problem of this kind, it deals with finding a structure in a collection of unlabeled data. A loose definition of clustering cloud is “The process of organization objects into groups whose members are similar in some way”. A cluster is therefore a collection of objects which are “similar” between them and are “dissimilar” to the object blogging to other clusters [11].

The customer relationship for example, When a new customer arrives, he/she is classified into any one of the existing clusters [4][ 5]. The property of the customer is said to correspond to the properties of the cluster in which they are classified into. The customer relationship management using the clustering data from the unwanted data to the original data into the business process management [11].

### 2.1.4 Forecasting Process

Forecasting techniques are subjective, based on the opinion and judgment of consumers, experts; appropriate when past data is not available. It is usually applied to intermediate-long range decisions. Quantitative forecasting models are used to estimate future demands as a function of past data; appropriate when past data are available. The method is usually applied to short-intermediate range decisions. The process of climate change and increasing energy prices has led to the usage. It is involves the generation of a number, set of numbers, or scenario that corresponds to a future occurrence. It is absolutely essential to short-range and long-range planning [17].

Year	Quarter	t	sales	Forecast
2005	1	1	350	500
	2	2	250	350
	3	3	500	200
	4	4	600	400
2006	1	5	200	250
	2	6	100	350
	3	7	300	200
	4	8	200	100
2007	1	9	400	550
	2	10	300	450
	3	11	100	250
	4	12	500	450



2008	1	13	400	200
	2	14	300	300
	3	15	100	450
	4	16	200	200
2009	1	17	300	450
	2	18	200	250
	3	19	400	300
	4	20	250	250
2010	1	21	350	200
	2	22	100	250
	3	23	250	200
	4	24	300	250

**Figurer1. Forecasting the year of publishing product**

### 3. Business Process Association with CRM

A customer relationship management system is to improve the product quality and develop the business process. The existing system develops for the customer relationship business management process to implement using for customer relationship management classification algorithm. It contains,

$$Pq = (mi, mj) = \left( \sum_{i=1}^p (mi, i - mj, i) 2 \right) 1/q$$

$$= |mi - mj| 2$$

In this algorithm is used to the distributed sale for extract the data. The **Pq** means consumer relationship management for the business process. The **mi** and **mj** the number of customer wants to product the relationship management. The summation of ( $\sum$ ) the total number of customer then **I=1** the number of customer relationship and the organization production. Then the total number of product implementation find out to the business process of product,

$$P2 = (mi, mj) = \left( \sum_{i=1}^p (mi, i - mj, i) 2 \right) 1/2$$

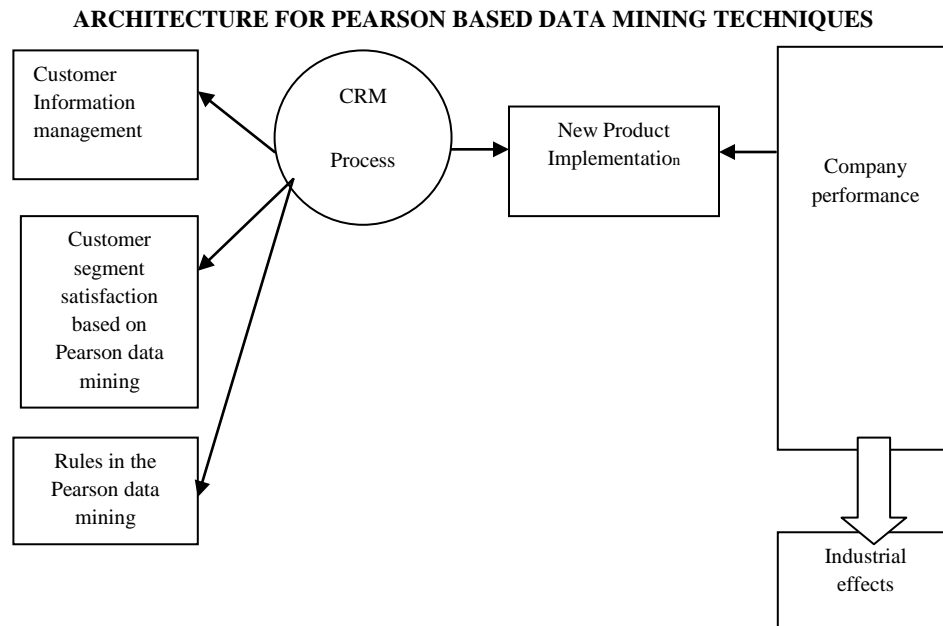
$$= |mi - mj| 2$$

In this problem is used to **P2** for the total number of product details then calculate to the customer association in an organization [4][5]. The summation of ( $\sum$ ) the total number of customer and reduction to the unwanted message and then compare to the previous product and product then calculate to the final source the product an business process[11] for customer relationship in the organization process.

### 4. Proposed Work in Business Process Relationship Management

In existing systems followed an implement to the proposed system techniques of using data mining concepts for data sets in an organization. In this paper, we develop a Pearson correlation coefficient based data mining in customer relationship management, for mining large datasets in an organization, so our results should be perfect, which the companies having a large number of datasets, and also the organizations should satisfy customer needs. In the proposed system we implement the concept of Pearson correlation coefficient based data mining on customer relationship management process using the company performance development with wants to the customer and develop to the products.





**Figure 2. Architecture for business relationship management**

In this architecture (eg. Figure 2) suppose in the large organization the dataset will be high, so for mining the customers in the particular organization, we use the method of Pearson correlation coefficient method. With this method we can identify the customers that they interacted with the product of particular organization, among the millions of the product in the particular organization. This method is calculated among the following needs to satisfy the customers based on the:

1. PEARSON
2. INNOVATIVE
3. CUSTOMER RELATIONSHIP
4. SIGNIFICANCE WITH ASSOCIATION RELATIONSHIP

#### 4.1 PEARSON

In this algorithm based on the way of working it contains

$$\text{Pearson}(x, y) = \frac{\sum (xy) - (\sum x)(\sum y)}{\sqrt{\sum (x^2) - (\sum x)^2 / n} \sqrt{\sum (y^2) - (\sum y)^2 / n}}$$

Pearson's r is always between -1 and +1, where -1 means a perfect negative, +1 a perfect positive relationship and 0 means the perfect absence of a relationship. Pearson's r is symmetric. The correlation between x and y is the same as the correlation between y and x. Pearson's r is also referred to as the "bivariate correlation coefficient" or the "zero-order correlation coefficient."

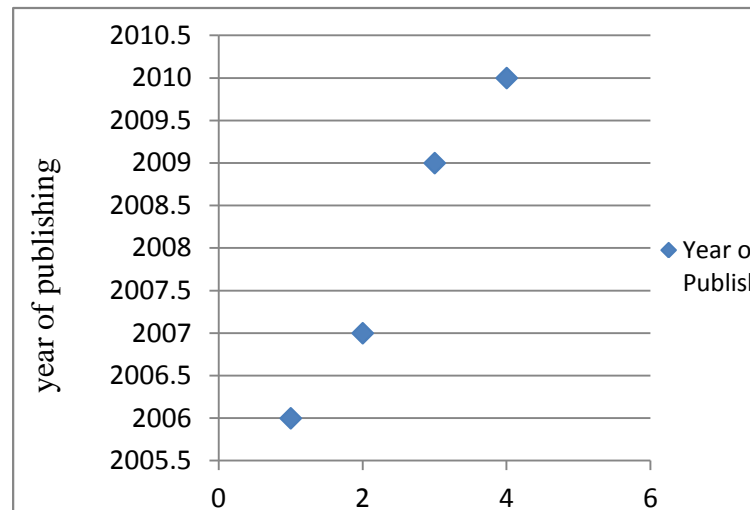
#### 4.2 INNOVATIVE

Suppose if the customers satisfied in the particular product of the organization, the result should be positive, meaning that high scores on the product test to be paired with relatively high scores on the other products which have large capabilities with the reason updated software products. In other words, if a product scored high on all over the millions of product test, we would predict that the product scored relatively high on the creativity test, and if the product scored low on the customer satisfaction product test we would predict that the product should get also scored low based on the customer needs. Of course, this method won't be true for every product, but it will tend to be true. This implies that can predict creativity from customer suggestions about the particular product.



### 4.3 CUSTOMER RELATIONSHIP

The number of product develop in an organization to a customer wants,for mining large datasets in an organization, so our results should be perfect,which the companies having a large number of datasets, and also the organization should satisfy the customer needs.



Graph1.Year of publishing for customer relationship

In (eg.Graph1) a customer to satisfy for the product development in an organization should increase for product level. Increase a customer wants to product level automatically increase to the year of publishing then product level is high.

### 4.4 SIGNIFICANCE WITH ASSOCIATION RELATIONSHIP

The **Pearson correlation coefficient rules**, the organization of the example in conditions of whether the product range is high or not according to the needs of a customer. The association relationship based on the Pearson correlation coefficient rules. So let us derived the software product data based on association rules in the below table.Some good ones are as follows:

Algorithm:

Step1: If Software product = customer satisfaction then year of publishing =current year, t hen

Step2: If year of publishing = current year - below two years and Market Level = High then

Step 3:If No Product = customer satisfaction then product = current year, then

Step 4: If product = Usage high, then

Step5: If Customer satisfaction = good and Privilege management offer for that product = Free Mail then

Step6: If Usage = high and then a Customer satisfaction for that product is HIGH

Step7: If product = Usage is High and then customer satisfaction is high and then the product level is HIGH

Figure3. Steps in Algorithms



In (Eg.Figure3) the algorithm is used to implement to a customer relationship management process. The Pearson algorithm is used to develop for a customer wants increase and product level increase. In this step by step process to develop for the business process management product. The software product to develop for the customer wants means to market level is increase otherwise to below the market level for the customer relationship management process.

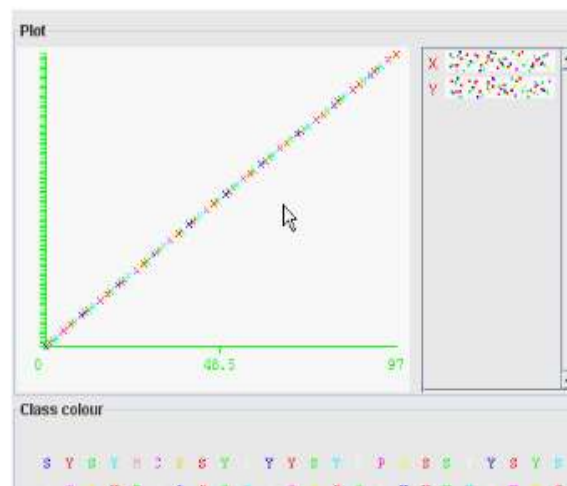


**Figure 4. Classifications for Customer Relationship**

If look for rules that customer relationship classify correct, then to find out increase process. The prediction for the product must be the outstanding product compare to the other software product according to the market level and the customer usage of the product must be high.

### Compute Pearson's Correlation Coefficients

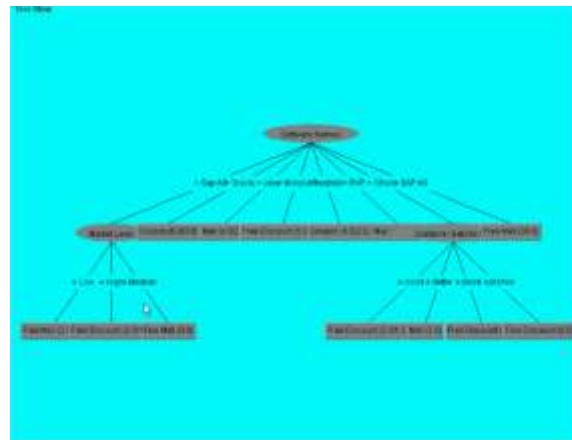
In this algorithm is used to implement a customer relationship in an organization. It contains business process development diagram



**Figure 5. Pearson Correlation Business Process**

The customer relationship management for product development process using Pearson's correlation coefficients with data mining techniques. (eg.Figure5), this algorithm used to implement the customer relationship between the management. The CRM process to do the management relationship and customer satisfaction based on Pearson data mining and product implementation in an organization. The company performance based on to develop the quality and customer satisfaction for the business.





**Figure 6. Customer specifications for the business**

In this algorithm has been used to implement for a company product and to develop the customer relationship management process. (eg.figure6).The management was to develop the customer relationship and implement for the business. The existing system to implement the CRM process is used for 60% to 80% for a customer relationship. But the proposed system is used to Pearson correlation coefficient algorithm to develop for 90% & to 98% for a customer relationship. In this algorithm is used to develop to efficiency for customer relationship management used to data mining.

## 5. CONCLUSION

The customer relationship management is used to Pearson correlation coefficient algorithm based on improve the quality of the business. The existing system is it commonly accepted the CRM implementation a feature enhancement for 60% to 70%. But the proposed, used the Pearson correlation coefficient implement to a customer relationship for 90% to 95%. The value chain produces the implementation of company product or service is linked with make available a customer relationship management. The set of linkage and relationships that are required to create a product or services is described as a value network.

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