Oriflame Cosmetics

Product Classification in Supply Chain

Master Thesis

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Index

Abstract

Oriflame is a famous international direct sale cosmetics company with complicated supply chain operation but it lacks of a product classification system. It is vital to design a product classification method in order to support Oriflame global supply planning and improve the supply chain performance. This article is aim to investigate and design the multi-criteria of product classification, propose the classification model, suggest application areas of product classification results and introduces the product classification system into Oriflame ERP system. The research scope is defined within Oriflame supply chain from the order placed to suppliers by Global Supply department to the products received in Global Hubs.

Investigation approaches in this article including information collection, multi-criteria integration, and quantified analysis. In addition, sample calculation and test to stakeholder departments have been done after the proposal of product classification system.

The product classification applies a cross tabulate matrix to classify products into four classes (ABCD classification), it is believed that the results keep consistent at high level with both the calculation time horizons' increasing and the monthly forecast report update.

Hence, Product Classification System is supposed to be applied in supply planning prioritization, inventory management and workforce balancing, etc.

Key Words

ABC classification, supply planning, multi-criteria, cross tabulate matrix, supply chain management

Acknowledgment

This project is the thesis of master program Production Engineering and Management in Kungliga Tekniska Högskolan (KTH). The thesis report is completed by Yaoxuan Xu and Lihong Xing. The project aims to create a product classification system in Oriflame Cosmetics to improve the supply chain performance. It was accomplished during the period February 15th to July 2nd 2010 under the great sponsor of KTH supervisor Ove Bayard, and Oriflame Strategic Planning Manager Karl Jennings.

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1 Introduction

1.1 Background

Oriflame is one of the fastest growing beauty companies selling direct in the world. The company runs in 63 countries and produces around a thousand different products ranging over 6 categories in 5 manufacturing factories. Oriflame has a high volume of production, capacity, products types and sales force. It is known that Oriflame offers a wide range of high-quality beauty products; the sales force consists of approximately 3.3 million consultants that are marketing the products around the world. Oriflame product philosophy is to combine the wisdom of nature and best of science. Oriflame launches approximately 450 new products each year, and the general products portfolio has achieved 950 annually. Furthermore, it can be mentioned that Oriflame products range cover six categories, comprising Skin Care, Color Cosmetics, Fragrances, Personal & Hair Care, Accessories and Wellness, all of which are under the administration of Global supply planning. Sales are achieved in four main regions including CIS, EMEA, Asia and Latin America which are under the supervision of Global distribution planning team. Global planning department is responsible for the supervision of global supply planning of all the categories and distribution planning for the four regions.

The catalogue is the ‘’shop window’’ of Oriflame which is planned and published every 3 weeks in 35 languages among the 4 regions, and 17 campaigns are held yearly. The combination of product and catalogue development, in addition to the frequent dynamic and attractive catalogues with many new products creates business opportunities for market sales[1].

1.2 Problem Description

Oriflame has a large product portfolio and the supply chain is complicated operated, yet it lacks a product classification within supply chain. It is therefore necessary to create a product classification system (PCS) based upon the analysis of current product information in supply chain which will aid and support the improvement in performance of Global Supply Planning. Oriflame has a classification system on a category level however it does not contain attributes such as key launch, offer, volume, profitability, and value etc. Upon developing the classification system, optimization of this through planning parameters and methods will be investigated. By generating a PCS it will enable prioritization and alignment within supply from forecasting to distribution activities.

To develop the project, two main aspects will be included as following:

- Product Classification

Create a Product classification system for the supply chain. Product classification requires cooperation with relevant departments and information gathering from key sectors of the company, the philosophy and methodology of the classification is to be illustrated.

- Application of PCS in Global supply

To standardize and support Global supply in Oriflame, the PCS will provide guidance to supply planning. Requirement, opportunities, benefits and risks of the system should be investigated. After which, the PCS should be turned into practical application. During the processes, the key is to make the supply chain management more efficient and effective, through transparency and alignment activities. The opportunities of utilizing PCS in Oriflame will be reviewed with the planning tools available and suggested improvements will be made.

Based on above, the expected outcomes are as following.

- The reasonable and measurable criteria of product classification with:
    - Quantified analysis results
    - Scope definition of criteria selection
    - Multi-criteria product classification proposals

- Product classification results on product code level with relevant product information
- Classification methodology in supply chain specially applicable to Global supply planning in Oriflame
- High level suggested utilization areas of product classification results

1.3 Objectives and Opportunities

1.3.1 Objectives

Create a product classification system for Global Supply Planning. PCS with transparent and clear classification process which is understandable, agreed and implementable to the stakeholders. To strongly support the decision-making of key activities within supply chain, not as an individual entity, the classification system should be integrated into supply chain management in order to improve Global Supply Planning performance and efficiency.

- Understandable, agreed and implementable PCS

Make sure stakeholders easily understand how PCS works and acceptance for implementation of PCS. Process of classification conforms to standard business process in Oriflame. So employees can quickly take on classification once they are familiar with business process flow in Oriflame.

- Give solutions and support to Global Supply planning

It is a great challenge that nearly one thousand products and 700 million units are manufactured and delivered to customers every year in Oriflame. One purpose is to simplify and minimise this challenge. Products classification system is designed to give solutions and support decision-making for Global Supply Planning. For example, higher priority of products requires shorter lead time of supplying. Review and propose planning processes within the different classes and prioritization of planning based on PCS.

- Integrated into supply chain management

Assure products classification system consistent with target and strategy of supply chain management in Oriflame Cosmetics. The compatibility of PCS allows it to

benefit not only Global Supply Planning but also other key activities within supply chain in Oriflame. PCS could never be independent and aside from whole supply chain while it must be integrated into supply chain.

1.3.2 Opportunities

- Release planners from non-value-adding work

With support from PCS, planners can design similar supply strategy for products in same class. It can be seen as a big waste of vigor and attention of planners to look for proper supply strategy of products one by one. Apparently, the repeated planning for similar products is non-value-adding work. PCS will release planers from non-value-adding work and even motivate their passion to main products planning. Aligning to agreed business direction, classification priority will increase UFR and OFR to reach high service level.

- Increase effectiveness and efficiency of Global Supply

Applying standardized classification will increase communication effectiveness and build strong connection among key activities in Global Supply. It will be easy to track the flow of Global supply and find out which activities have negative impact on performance of Global supply, and then improve efficiency by eliminating negative impact.

- Increase transparency of information

Utilization of product classification will also increase the information transparency of data warehouse of ERP system in Oriflame. For the sake of Global Supply planning, it is supposed to involve and clarify all the product classification information in detail and make all the key users of PCS available to export product information on product code level. For instance, check an A product with product code, volume, value, integrated catalogue elements, super launch status, product lifecycle and offer type, etc.

1.4 Scope and Delimitation

The project seeks for the improvement of supply planning department, and the product classification will contribute primarily to delivery plan of Global supply, therefore the manufacturing phase and the distribution from warehouse to the market would not be taken into consideration. The scope of PCS usage is a part in Oriflame supply chain shown in Figure 1.1. Future possibilities exist during the application phase to link the project stakeholders in Oriflame supply chain.

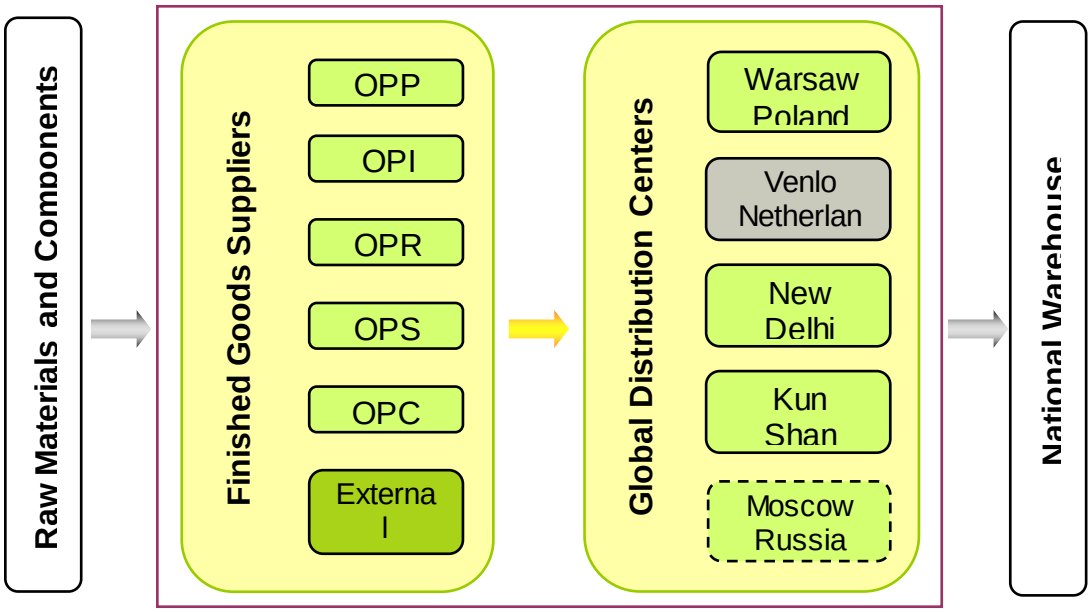


Figure 1.1 PCS in Supply Planning Process

The project intend to develop from the forecasting to the supply delivery plan, and end with the finish goods received by Global Distribution Centers. Data are sourced from Oriflame Forecasting Top level Report and the relevant supply plan documents.

After the feasibility study, the project focuses on the analyzed results of product volume and value, catalogue sections and Super Launches. Analyses which are out of product classification scope will be discussed in next section.

1.5 Methodology

1.5.1 Project Phase and Timeline

The project methodology is defined by six phases including Pre-study, Feasibility study, Design build & test, Integration test, Business Readiness & Implementation and Post go-live, which will be clearly described in the following sections[2].

The project lasts for 20 weeks and different time periods are set for the phases depend on the procedures. The project phase and timeline are shown on high level in Figure 1.2.

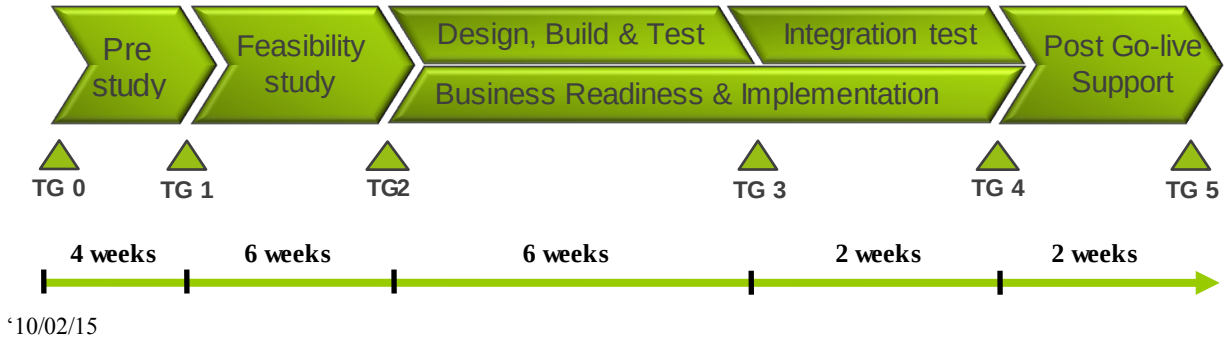


Figure 1.2 Project Phase and Project Timeline

1.5.2 Project Procedures

Pre-Study – To give background and context to project objectives

- Specify project with basic information, background, time line, resource plan, project organization, stakeholders and high level project scope definition
- Suggest the forward steps of project

Feasibility Study – Evaluate feasibility and effort of the project scope

- Literature study
- Define the project scope
- Risk analysis and proposal selection
- Suggest PCS implementation approach

Design, Build & Test – To bring the blueprint into design and to build the solution

- Specify the function and technical requirement of PCS
- Develop solution
- Input test scenario to integration test

Integration Test – Adjust solution and get feedback

- Determine test approach and make test plan
- Test objectives and expectations definition

- Tested results analysis and feedback

Business Readiness & Implementation – IT, market and business preparation for deployment of solution

- Determine application instructions
- Detailed roles, key users and timing definition
- Post Go-live support plan

Post Go-Live – Assure stable solution before hand-over to business

- Solution handover to users in the company
- Project review and evaluation

As stated above, the first two phases require data source from the relevant departments, the literature of product classification theory as well as the case study of current product classification within or out of the company. While during the following phases, it's highly recommended to deep communicate with stakeholders and ask for IT support of ERP integration. It is hoped that the whole project procedures could develop in a reasonable and logical way.

2. Literatures Review

2.1. Traditional ABC Analysis: Pareto 80-20 rule

2.1.1 Pareto 80-20 theory

Definition

In early 20 century, Italian economist Pareto's discovered that 20 percent of the people owned 80 percent of the wealth. Then the 80/20 Rule came about which means in anything a few (20 percent) are vital and many (80 percent) are trivial[3].

Application

The rule can be applied from economy, industry to physical world in reality. In the inventory field, the phenomenon such as 20 percent of stock account for 80 percent of warehouse space and that 80 percent of the products are produced by 20 percent of the suppliers. Also 80 percent of the sales come from 20 percent of product items or even less of them.

Pareto Diagram and ABC classification

To apply Pareto theory to ABC-classification visually, the Pareto Diagram is introduced.

The Pareto Diagram includes two graphs as shown in Figure 2.1:

- Bar Chart: the bars show a value for each object, and are displayed in descending order, which identify the importance of the causes. In Figure 2.1, the bars represent the sales in quantity of a small range of products.
- Line chart of accumulations of bars: the line shows the cumulated percentage of objects. Here it represents the sales contribution of products with the grades decrease. It can be seen that the fast moving products account for small range of product portfolio, and vice versa.

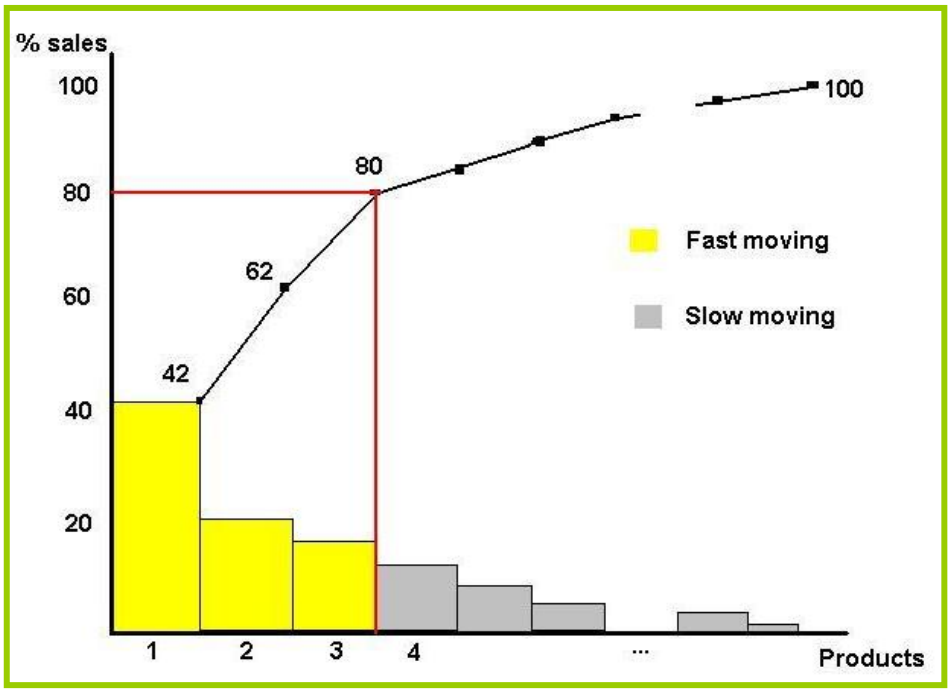


Figure 2.1 Pareto Diagram

2.1.2 The traditional ABC classification

Definition

ABC classification is a method to classify items into three classes based on the quantified analysis of transaction volume and value and the multiplication of those two. ABC classification will be applied to define the importance of different items in the supply chain operation. Traditionally, ABC classification is a useful tool for inventory control and often gives the link to safety stock.

ABC classification groups a range of items, for example the products and components, into 3 classes A, B, and C, and each class will account for different proportion in the total quantity. The threshold of each class follows the Pareto's 80-20 rule which will be illustrated later in next sector[4].

- 0 - 80 %: A items
- 80 – 95 %: B items
- 95 - 100 %; C items

Purpose

- Setting hierarchies and priorities among the items to optimize the supply planning
- Reduce the non-value adding planning work
- Focusing on the items with high business opportunities and profit

Applications

- Purchasing – based upon component lead time, volume and value, supplier performance to classify items into ABC classes
- Supply planning – based upon offer type, volume and value, capacity and sales speed to classify items into priorities
- Inventory control – based upon the move rate to classify items into hierarchies

Procedures

- Select criteria based on importance level
- Data analysis in terms of the criteria
- Data ranking in descending order
- Calculation of cumulative percentage for each item
- Classify according to Pareto theory into A, B and C classes
- Define the attributes for each class
- Input to shareholders
- ABC recalculation by different frequency according to the attributes of ABC classes

2.2. Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process provides a technique to deal with complex decisions making and gives a solution to analyze and weighting multiple selected criterion, especially for immeasurable criterions. It was developed by Thomas L. Saaty in the 1970s and has been extensively studied since then, with reference to mathematics and psychology. AHP does not only consider objective evaluation measures but also subjectivities. One of the most important advantages of AHP is to provide a useful mechanism to specify and quantify decision-makers' preference. In addition, it checks the consistency of the evaluation measures and alternatives or criterions suggested by projects. So far, AHP has been applied all over the world in a wide range fields such as education, government, industry, business and healthcare, etc.

According to Saaty [5], the procedure for using the AHP can be summarized as:

Model the problem as a hierarchy containing the decision goal, the alternatives for reaching it, and the criteria for evaluating the alternatives. This step can be demonstrated as Figure 2.2:

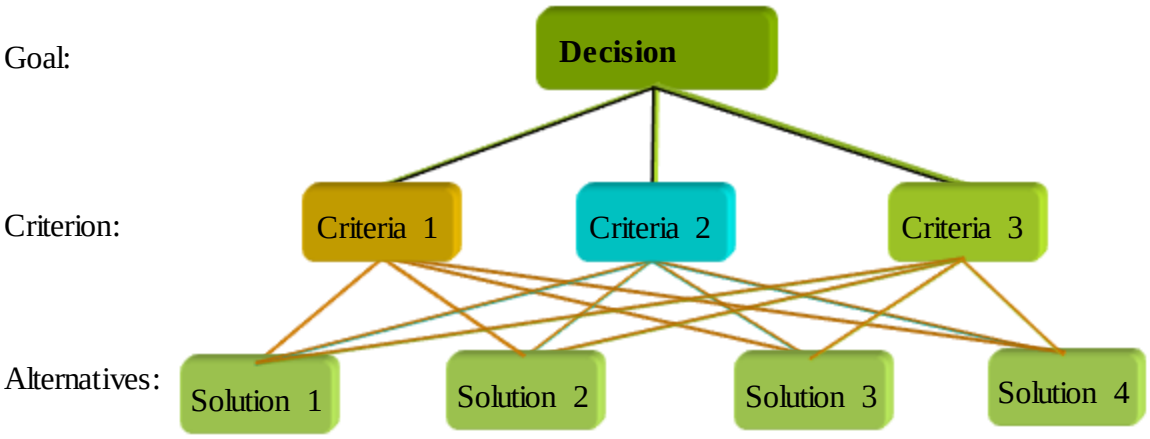


Figure 2.2 Hierarchy framework of AHP

Establish priorities among the elements of the hierarchy by making a series of judgments based on pair wise comparisons of the elements. For example, when comparing potential real-estate purchases, the investors might say they prefer location over price and price over timing. Synthesize these judgments to yield a set of overall priorities for the hierarchy. This would combine the investors' judgments about importance value of alternatives for criterions 1, 2 and 3 into overall priorities for each solution.

Before setting priorities of elements, measurement scale is designed for pair wise comparisons of available solution and criterions. Within this paper, the scale form Table 2.2 is used at quantified analysis of catalogues section. Since AHP method is used on the purpose of ranking alternatives under one criterion in this project, the combination of priorities evaluation at different level don't exist.

For example in comparing a cherry tomato with a watermelon according to size, one uses a process of clustering with a pivot from one cluster to an adjacent cluster that is one order of magnitude larger or smaller than the given cluster, and continues to use the 1–9 scale within each cluster, and in doing that, the scale is extended as far out as desired. What determines the clusters is the relative size of the priorities of the elements in each one. If a priority differs by an order of magnitude or more, it is moved to the appropriate cluster. Hypothetical elements may have to be introduced to make the transition from cluster to cluster a well-designed operation.

Figure 2.3 shows five geometric areas to which we can apply the paired comparison process in a matrix to test the validity of the procedure. The object is to compare

them in pairs by eyeballing them to reproduce their relative weights. The absolute numbers for each pair wise comparison are shown in the matrix in Table 2.1.

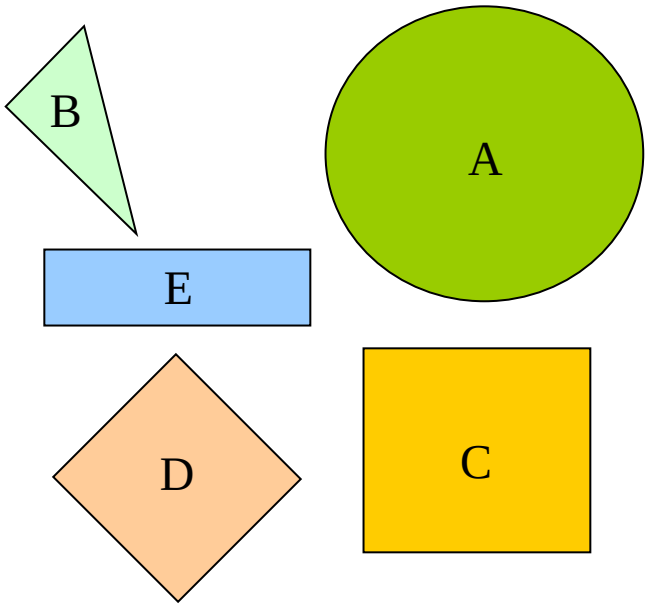


Figure 2.3

Figure	Circle	Triangle	Square	Diamond	Rectangle	Priorities	Normalized weight	Actual size
Circle	1	9	2	3	5	3	0.462	0.471
Triangle	1/9	1	1/5	1/3	1/2	1/3	0.049	0.050
Square	1/2	5	1	3/2	3	13/8	0.245	0.234
Diamond	1/3	3	2/3	1	3/2	1	0.151	0.149
Rectangle	1/5	2	1/3	2/3	1	5/8	0.093	0.096

Table 2.1 Comparison Matrix

In EXCEL, after getting comparison value for pairs, the overall priorities of each item can use some function as Power (Product (value1: value 5), 1/5). Then normalize priorities. According to NG model, the use of normalized weights has some advantage for interoperation. All weight is always within interval 0-1 as all measures for other criteria. The weight value of a particular item is equal to the proportion of the importance of such item out of total importance of all items. All partial scores are in a comparable base when both weights and measurement are normalized.

Check the consistency of the judgments: given the comparison matrix A, the A_{ij} represents the relative strength of Item i when compared to j. Thus, the matrix is consistent if $A_{ik} = A_{ij} * A_{jk}$, for all *i, j, k* <=n, where n is the size of the matrix (number of compared item). Saaty has shown that if diagonal of a matrix A consists of ones ($A_{ii} = 1$), for all i, and if A is consistent, then small variations of the A_{ij} keep the largest Eigen value λ_{max} close to n, and remaining Eigen value close to zero. Therefore, is A is a matrix of pair wise comparison values, in order to find weight vector, a vector w that satisfies $Aw = w\lambda_{max}$ is to be found. AHP makes use the consistency test that presents priorities from being accepted if the inconsistency level is high[6]. In order to measure the deviation of matrix A from consistency, a consistency index C.I. is denoted as $\lambda_{max} - n/(n-1)$ and a random index R.I. is calculated as the average of the C.I. of many thousands reciprocal matrices randomly generated from the scale 1 to 9 with reciprocal forced. It is shown in table 2.2 that values of R.I. for matrices of size 1, 2… 10 can be found from Saaty in 2005. A consistency ratio of 0.10 or less is acceptable.

n	1	2	3	4	5	6	7	8
R.I.	0	0	0.52	0.89	1.11	1.25	1.35	1.4

Table 2.2 Random Index of comparison matrixes

According to Saaty 2005[7], inconsistency of a pair wise comparison matrix is due to the inconsistent comparison of the decision maker. In that case, the decision maker is asked to modify the matrix repeatedly until the matrix is consistent.

Come to a final decision based on the results of this process. After comparison matrix and consistency analysis, according the overall weight of alternatives, the best or worst alternatives can be selected to meet to the goal.

2.3. Multiple criterion analysis: all literatures

In the past more than 20 years, research literatures on multi-criteria ABC classification have been extensively developed. Among them, Flores and Whybark[8] in 1986 proposed a cross-tabulate matrix for multi-criteria classification and applied it to a service organization and a manufacturing firm. In 2005, a weighted linear optimization model for multi-criteria ABC inventory classification is developed by Wan Lung N.g[9], hereafter called as the Ng-model. Then in 2008, A. Hadi-Vencheh[10]

proposed an improved version of Ng-model by consideration weights values for multi-criteria ABC classification, which is called as AH-model in this paper.

2.3.1. Cross-tabulate matrix

This method begins with selecting another non-cost criterion, in addition to single criterion of annual dollar usage. This criterion depends on the nature of industry like lead time, obsolescence, availability, etc. According to traditional ABC classification, all items with different level of annual dollar usage are divided into A, B and C classes. Related managers can apply this principle by focusing on “significant few” (items of Class A) and spending less time on the “trivial many” (items of Class C). Then with respect to another criterion, items can also be grouped into three initial categories.

With combination of two criteria, the cross tabulate matrix can illustrate the reassess of classification as show as in Figure 2.4.

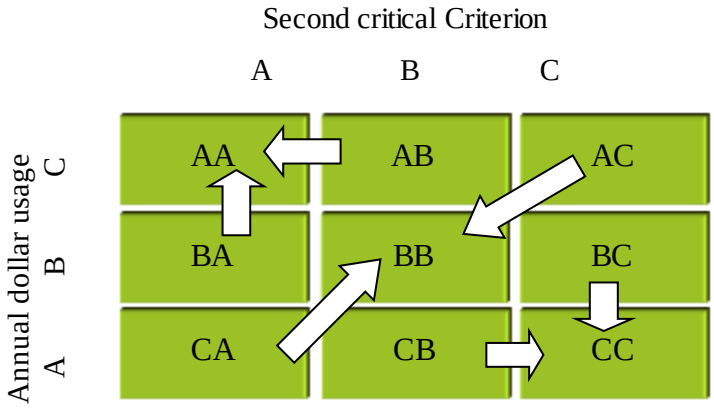


Figure 2.4 Cross Tabulate Matrix

This model simply assigns every item in AA, AB and AC into Class A; every item in AC, BB and CA into class B; and every item in BC, CB and CC into Class C. When adding a third criterion, the reassessment can be done between criteria 3 and classified result of criteria 1 and 2. Obviously, this cross tabulate matrix is easy to understand and simple to use. However, this model ignores the weight for different criteria and treats criteria equally.

2.3.2. Ng- Model

This method converts all criteria measures of an item into a scalar score. The classification based on the calculated scores using ABC principle is then applied with

proper transformation, the Ng-model can obtain the scores of items without a linear optimizer. It is flexible as it could easily integrate additional information from decision makers for classification.

Assume that there are I items, and that the items have to be classified as A, B or C based on their performance in terms of J criteria. In particular, let the performance of i_{th} item in terms of each of the criteria be denoted as $y_{ij.}$ For simplicity, further assume that all the criteria are benefiting type criteria, i.e. they are positively related to the importance level of an item. The purpose is to aggregate multiple performances scored of an item with respect to different criteria into a single score for the subsequent ABC classification. In the Ng-model, the author firstly transforms all the measures to comparable base. Using transformation

$$\frac{y_{ij} - \min_{i=1,2,\ldots,j}\{y_{ij}\}}{\max_{i=1,2,\ldots,j}\{y_{ij}\} - \min_{i=1,2,\ldots,j}\{y_{ij}\}}$$

.With which, all measurement can be converted into a 0-1 scale for all items. “Table 1”[10] shows the transformation example.

Table 1
Measures of inventory items and transformed measures.

Item	AUC	ADU	LT	AUC (transformed)	ADU (transformed)	LT (transformed)
1	49.92	5840.64	2	0.22	1.00	0.17
2	210	5670	5	1.00	0.97	0.67
3	23.76	5037.12	4	0.09	0.86	0.50
4	27.73	4769.56	1	0.11	0.82	0.00
5	57.98	3478.8	3	0.26	0.59	0.33
6	31.24	2936.67	3	0.13	0.50	0.33
7	28.2	2820	3	0.11	0.48	0.33
8	55	2640	4	0.24	0.45	0.50
10	160.5	2407.5	4	0.33	0.41	0.83
9	73.44	2423.52	6	0.76	0.41	0.50
13	86.5	1038	7	0.00	0.18	0.17
11	5.121	1075.2	2	0.08	0.18	0.67
12	20.87	1043.5	5	0.40	0.17	1.00
14	110.4	883.2	5	0.51	0.15	0.67
15	71.2	854.4	3	0.32	0.14	0.33
16	45	810	3	0.19	0.13	0.33
17	14.66	703.68	4	0.05	0.12	0.50
18	49.5	594	6	0.22	0.10	0.83
19	47.5	570	5	0.21	0.09	0.67
20	58.45	467.6	4	0.26	0.08	0.50
22	65	455	4	0.09	0.08	0.50
23	86.5	432.5	4	0.29	0.07	0.50
21	24.4	463.6	4	0.40	0.07	0.50
24	33.2	398.4	3	0.14	0.06	0.33
27	84.03	336.12	1	0.16	0.06	0.00
29	134.34	268.68	7	0.14	0.05	0.33
25	37.05	370.5	1	0.39	0.05	0.00
28	78.4	313.6	6	0.36	0.05	0.83
26	33.84	338.4	3	0.63	0.04	1.00
31	72	216	5	0.25	0.03	0.00
30	56	224	1	0.33	0.03	0.67
32	53.02	212.08	2	0.23	0.03	0.17
33	49.48	197.92	5	0.22	0.03	0.67
35	60.6	181.8	3	0.01	0.03	1.00
36	40.82	163.28	3	0.27	0.03	0.33
34	7.07	190.89	7	0.17	0.02	0.33
38	67.4	134.8	3	0.12	0.02	0.67
37	30	150	5	0.30	0.02	0.33
39	59.6	119.2	5	0.27	0.02	0.67
40	51.68	103.36	6	0.23	0.01	0.83
42	37.7	75.4	2	0.07	0.01	0.17
41	19.8	79.2	2	0.16	0.01	0.17
44	48.3	48.3	3	0.12	0.01	0.67
43	29.89	59.78	5	0.21	0.00	0.33
45	34.4	34.4	7	0.14	0.00	1.00
46	28.8	28.8	3	0.12	0.00	0.33
47	8.46	25.38	5	0.02	0.00	0.67

To facilitate the inventory classification under multiple criteria, Ng defines a non-negative weight w_{ij} which is the weight of contribution of performance of the i_{th} item under the j_{th} criterion to the score of the item. It is assumed that the criteria are ranked in a descending order such that $w_{i1} \geq w_{i2} \geq \cdots \geq w_{ij}$ for all item *i*. the purpose is to aggregate multiple performance scores of an item with respect to different criteria into a single score for the subsequent ABC analysis. The Ng model is shown as following model 1,

$$\max \ S_i = \sum_{j=1}^{J} y_{ij} w_{ij}$$

$$\text{s.t.} \quad \sum_{j=1}^{j} w_{ij} = 1,$$

$$w_{ij} \geq w_{i(j+1)} \geq 0, j = 1, 2, \dots, J.$$

$$w_{ij} \geq 0, j = 1, 2, \dots, J.$$

Based on the transformation, $u_{ij} = w_{ij} - w_{i(j+1)}, u_{ij} = w_{ij}$ and $x_{ij} = \sum_{k=1}^{j} y_{ik}$, model 1 is converted to the following model 2 for all inventory items:

$$\max \ S_i = \sum_{j=1}^{J} x_{ij} u_{ij} \ ,$$

$$\text{s.t.} \quad \sum_{j=1}^{j} j u_{ij} = 1,$$

$$u_{ij} \geq 0, j = 1, 2, \dots, J.$$

The objective value of maximum score Si of the ith item can be easily obtained as $\max_{j=1,2,\dots,J} \left(\frac{J}{j} \sum_{k=1}^{j} y_{ik} \right)$.

2.3.3. AH-Model

Despite Ng model's many advantages, it results the case that the overall score of item is independent of the weights generated in the model. That is the weights do not have any role for determining overall score of each item with respect to solution of Ng-model. As a result, items may not be classified properly. In order to handle this

issue, A. Hadi-Vencheh in 2008 proposed an improved and weighted optimization model, hereafter called as AH-model.

Firstly, apply the same transformation formula to convert items' performance into 0-1 scalar score. Then the extension version of optimization program is as follows

The

$$\max \ S_i = \sum_{j=1}^{J} s_{ij} w_j \ ,$$

$$\text{s.t.} \quad \sum_{j=1}^{j} w_j^2 = 1,$$

$$w_j \geq 0, j = 1, 2, \dots, J.$$

Where s_{ij} is the normalized attribute value of the i_{th} item with respect to the j_{th} criterion and w_j is the relative importance weight of the j_{th} criterion. The analytical solution to model is found as

$$w_j^* = \frac{s_{ij}}{\sqrt{\sum_{j=1}^{J} s_{ij}^2}}, j = 1, 2, \dots, J.$$

2.4. Case Study

2.4.1 ABC-Reclassification in Ericsson AB

Background

Ericsson Master and Industrialization Center (MIC) is one of the most significant centers in Ericsson. The responsibilities of whom are to industrialize and supply 2G and 3G modules, as well as practice global master responsibility in maintenance and supporting the new products technology.

The thesis research is based on the planning group within MIC Logistic department which is responsible for maintaining and updating plans for production transportation and products upgrading[12]. The main purpose is to reduce the inventory cost in order to secure supply.

Current Problem

Since the organization has changed a lot, the production and material purchasing coverage time changed accordingly, it's necessary to reorganize the current product classification and optimize the processes without increasing the cost.

Objective

- Reduce ABC-classes
- Give coverage time recommendations for each new ABC-class according to actual factory conditions and different activity requirements.
- Give a consequence analysis of the recommended coverage time

Current situation:

- Material sorts: around 2000 in the CM(control manufactory) system
- ABC-classification is done based on Volume Value concept and data
- Volume Value = Annual Requirements * Unit Price
- Eight classes were involved in the classification. High ABC-classes material stock should be limited, and vice versa, low classes material should be purchased less frequently but with high volume.
- The thresholds of classification are constant figures.
- The ABC-classes policy and Pareto diagram are performed with thresholds shown in Figure 2.5 and Table 2.3:
- The safety stock volume is pretty high for H class but much less of the sum of the left seven classes. Meanwhile, the value of A and E are higher than the other although E class is not so important in volume value classification, moreover, B, D, F and G are more less of same value regardless of the different classes of sales volume value in quantity.

Classes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**Sum**
ABC-classes policy	60.00%	20.00%	9.00%	5.00%	3.50%	1.50%	0.70%	0.30%	100%
Share of total volume value	57.63%	16.69%	9.23%	5.69%	5.93%	2.51%	1.71%	0.61%	100%
Cumulative % of volume	57.63%	74.32%	83.55%	89.24%	95.17%	97.68%	99.39%	100%	100%

Table 2.3 Current ABC Classification

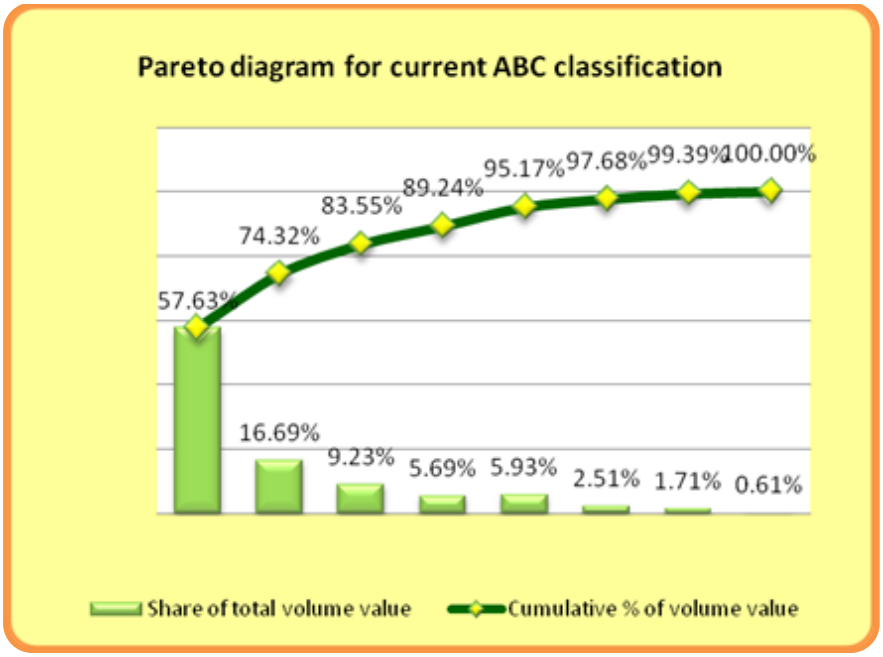


Figure 2.5 Pareto diagram for current ABC classification

Coverage Time (CT)

Coverage time is the time between two orders. For secure the production delivery, it is usually require more safety stock volume when the coverage time is longer. The current implementation of coverage time varies for the 8 classes which are shown as below.

ABC Classes	Average Actual CT	Objective CT	Deviation
A	11.1	2-6	5.1
B	12	4-10	2
C	19.5	6-16	3.5
D	21.3	8-20	1.3
E	29.1	10-30	0
F	35.4	20-60	0
G	42.5	30-100	0
H	56.5	40-130	0

Table 2.4 Deviation between objective and actual coverage time

Reasons for the deviation are large quantity package, change of the project plan and long lead time of suppliers, all of which lead to the fluctuation of material demand and long transportation time.

ABC Reclassification Proposal

ABC reclassification is necessary for Ericsson since the ongoing 8 classes are too many to deal with and make the relevant supply plan. The ABC reclassification is still based on volume value level, yet the classes reduce from 8 to 4.

Proposal 1

Volume value (VV) analysis with service factor and safety stock calculation (SS)

ABC-Classes	Number of Items	% of Total VV	Cumulative % of VV	Service Factor	Total Stock
A	23	59.39%	0%	0.15	699,386
B	55	20.61%	59.39%	0.30	517,869
C	215	14.99%	80.00%	0.90	1,394,844
D	1682	5.01%	94.99%	3.60	1,478,622
Sum	1975	100.00%	100%		4,090,721

Table 2.5 ABC Re-classification Proposal 1

Discussion

According to the ABC reclassification proposal, new service factors are proposed and the stock is calculated by multiply the value of service factor, daily requirement and lead time$^{0.7}$.The longest coverage rate is 60 days which are much less than 130 days in the old ABC classification.

The advantage of proposal 1 is that it reduces the workload for both purchasing and inventory management. In addition, A and B classes are keep the same cumulative percentage of, which therefore simplify the implementation process of ABC reclassification.

Nevertheless, since the safety stock increases 3.31%, it will lead to the larger investment of inventory.

Proposal 2

Volume value (VV) analysis with service factor and safety stock calculation (SS)

ABC-Classes	Number of Items	% of Total VV	Cumulative % of VV	Service Factor	Total SS
A	78	80.00%	0%	0.15	1,001,412
B	215	14.99%	80.00%	0.30	1,027,909
C	370	4.01%	94.99%	0.90	674,601
D	1312	1.00%	99%	3.60	457,403
Sum	1975	100.00%	100%		3,161,325

Table 2.6 ABC Re-classification Proposal 2

Discussion

According to the Volume value analysis, Proposal 2 has reorganized A and B classes with larger share among total product portfolio. Moreover, it reduces the safety stock level by 20%, which saves inventory investment and stock keeping space.

However, all the classes are modified by different product items that require changes of current material handling process and working procedures.

Hence, all of the two proposals require applicable test in the supply chain operation in order to reduce the cost and non-value-adding work.

At last, Ericsson selected Proposal 2 since it has reduced the safety stock level and the investment of inventory which are in line with the business plan of the company.

2.4.2 OPC Lead Time Reduction Project

Problem description:

The current supply chain of raw material involves long lead time in some of the key points which are bottleneck and limit the smooth operation of supply chain. The transportation from Europe to China production facility is the biggest bottleneck, since most of the raw material suppliers are lies in Europe. To shorten the transportation time and set the safety stock for the on hand inventory, raw material classification in terms of annual procurement value are considered to improve the supply chain operation.

Classification criteria

The three classes by annual procurement value are defined as following:

- Class a: annual purchasing value exceed CNY 100k
- Class b: annual purchasing value between CNY 50k~100k
- Class c: annual purchasing value less than CNY 50k

Classification Result Example

After the quantified analysis, OPC selects the local raw material supplier agents of the European suppliers to decrease the continental transportation time. After the action, the lead time of raw material has shortened by 42 days at most. The selected sample of ABC classification is shown in Table 2.7[12].

CODE	LT at EU Suppliers	LT/trans	Total LT	Class	Proposal	LT after Action
15302	10	42	62	a	set up safety stock 3000kg	0
15303	14	42	66	b	set up safety stock 500kg	0
15305	25	42	77	c	set up safety stock 350kg	0
15319	42	42	94	c	set up safety stock 25kg	0
15351	25	42	77	c	set up safety stock 50kg	0
15356	25	42	77	b	set up safety stock 360kg	0
15401	14	42	66	b	set up safety stock 500kg	0
15403	40	42	92	b	set up safety stock 36kg	0
15419	14	42	66	c	set up safety stock 70kg	0
15429	14	42	66	c	set up safety stock 10kg	0
16102	15	42	67	c	set up safety stock 25kg	0

Table 2.7 ABC Classification of Raw Material (RM)

Discussion

The classification has improved the transportation efficiency and shorten the transportation time from Europe to China, yet the thresholds of the three classes are only defined by the purchasing value from high to low level, in fact other criteria may also influence the safety stock level such as the supply constraints of the raw material supplier itself. Hence, to improve the operation of supply chain in OPC, more measures should be taken and the complex analysis could be done during the implementation phase.

3. Criteria Selection

3.1. Selection Approach

3.1.1. Information Collection

The main purpose of information collection is to understand operation of each department and what benefits can be gained from effective classification. Secondly, analyze the requirement which is not fulfilled by current classification methods and identify potential needs. Thirdly, understand current classification method and define important indicators to assess.

There is very clear and standardized business process in Oriflame. Overview of the relationship among key activities within global supply is shown on the supply chain architecture. However, it is required to relearn their relationship form product classification perspective, which is shown in Figure 3.1:

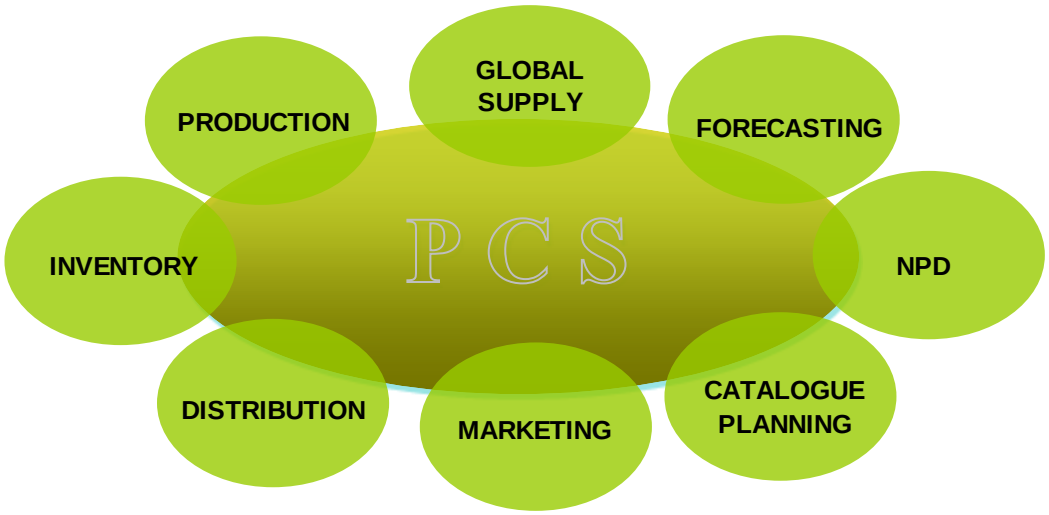


Figure 3.1 PCS in relation with Stakeholders

3.1.2. Criteria Option

The criteria will be summarized into two categories after information collection; one is the in scope criteria which are taken into consideration into product classification, the other is the out of scope criteria which might be to some extent back to scope in the implementation phase.

After the criteria option, the consolidate criteria will be extracted out and introduce into product classification model.

3.1.3. Quantified Analysis

Quantified analysis and scope definition will be done in order to propose the product classification model, and application procedures should be taken into consideration as well. The in scope and out of scope criteria are shown as below in Figure 3.2

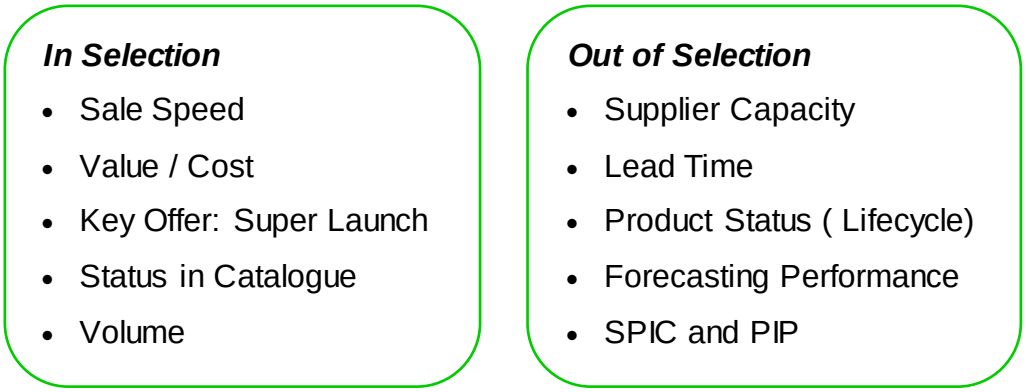


Figure 3.2 Product Classification Multi-criteria Outline

There are three consolidated criteria after the quantified analysis including sale contribution, catalogue elements and super launch (to be treated as a single criterion for evaluation and check of classification).

3.2. Sale Contribution

3.2.1. Criteria Definition

There is no doubt that it is critical to identify the key driver to sale for every profitable company. To some extent, importance of product is caused by how much benefit it brings. More benefits are obtained from the products; the more important it is to company. So what kind of these 'super star' products are? They are products with high value and demand from customers, that is products with high value * volume.

In Oriflame, sale speed analysis is undertaken by marketing department. Referring to Pareto's 80-20 rule, the best or worst selling products are recognized in volume. In general, traditional ABC analysis is done for products based on annual dollar usage, similar to criteria of value by volume. There is strong interaction among these three criterions: Value, Volume and Sale speed, which cannot be treated separately but together.

Due to real condition, a comprehensive criterion is developed as Sale contribution in value by volume, with the combination of three simple criterion of value, volume and sale speed.

3.2.2. Calculation

At first, under this criterion, products' importance is denoted as the following

Value * Volume of Product i / Sum of (Value * Volume of products)

Then Sale contribution of products is clearly. Next, it is important to identify which one has the biggest contribution to the company's sale. To fulfill it, arrangement of products in descending order of sale contribution is necessary. Then according to Pareto, accumulate calculation is required to help classify products.

3 classes 80%, 15%, 5% are introduced into classification as A, B, C from traditional ABC analysis, which is simple-to-understand and easy-to-use. As a result, large ranges of products are grouped into class C. For example, for Other-category, about 70% or 81 of products are class C, which is not helpful to improve the management of this less value products. Due to the real condition in Oriflame, Class D is required. After all, distribution interval of each class in terms of sale contribution is rearranged as Table 3.1

Classes	Distribution Interval
Class A	[0,80%]
Class B	[80%,95%]
Class C	[95%,99%]
Class D	[99%,100%]

Table 3.1 Classification Principle of Sale Contribution

In order to state calculation clearly, an illustrated sample is shown in Table 3.2.

Code	Value	Volume	Value * Volume	Sum of V*V	Contribution	Accumulative	Class
21669	2.73	103111	281493.03	1281210.66	21.971%	21.971%	A
21589	3.5	66443	232550.50	1281210.66	18.151%	40.122%	A
21706	1.13	185595	209722.35	1281210.66	16.369%	56.491%	A
22167	1.47	111518	163931.46	1281210.66	12.795%	69.286%	A
22135	6.99	12441	86962.59	1281210.66	6.788%	76.073%	A

21684	1.93	32525	62773.25	1281210.66	4.900%	80.973%	B
21452	1.69	17999	30418.31	1281210.66	2.374%	83.347%	B
21681	1.95	15257	29751.15	1281210.66	2.322%	85.669%	B
21542	3.05	9597	29270.85	1281210.66	2.285%	87.954%	B
22186	7.22	3608	26049.76	1281210.66	2.033%	89.987%	B
21545	1.85	12666	23432.10	1281210.66	1.829%	91.816%	B
21536	4.19	5185	21725.15	1281210.66	1.696%	93.512%	B
21578	2.63	6984	18367.92	1281210.66	1.434%	94.945%	B
21719	2.56	6259	16023.04	1281210.66	1.251%	96.196%	C
21653	2.06	7439	15324.34	1281210.66	1.196%	97.392%	C
21548	2.66	5263	13999.58	1281210.66	1.093%	98.485%	C
21711	0.2	66090	13218.00	1281210.66	1.032%	99.516%	D
22185	7.22	307	2216.54	1281210.66	0.173%	99.689%	D
21452	1.69	897	1515.93	1281210.66	0.118%	99.808%	D
21710	1.96	649	1272.04	1281210.66	0.099%	99.907%	D
21577	1.29	428	552.12	1281210.66	0.043%	99.950%	D
21709	4.35	99	430.65	1281210.66	0.034%	99.984%	D
21547	1	210	210.00	1281210.66	0.016%	100.000%	D

Table 3.2 Classification Sample based on Sale Contribution

3.2.3. Sample Classification Results

During classification, the coverage period should also be considered. In this paper, two time horizons are included in the analysis with consideration of higher forecasting accuracy and long term thinking. One case is 4 months, and the other is one year. Time horizon of 4 months is in alignment with global forecasting in Oriflame, while one year is the regular time horizon for traditional ABC analysis.

For the period of one year, classification results are shown in Table 3.3 and Figure 3.3 as below.

ALL SALES IN VALUE * VOLUME			
CLASS	**Bandwidth of Cumulative Percentage**	**Num of Product**	**Proportio**
A	[0,80%]	667	27%
B	[80%,95%]	632	25%

C	[95%,99%]	488	19%
D	[99%,100%]	716	29%
TOTAL	ALL	2503	100%

Table 3.3 One year Classification Result

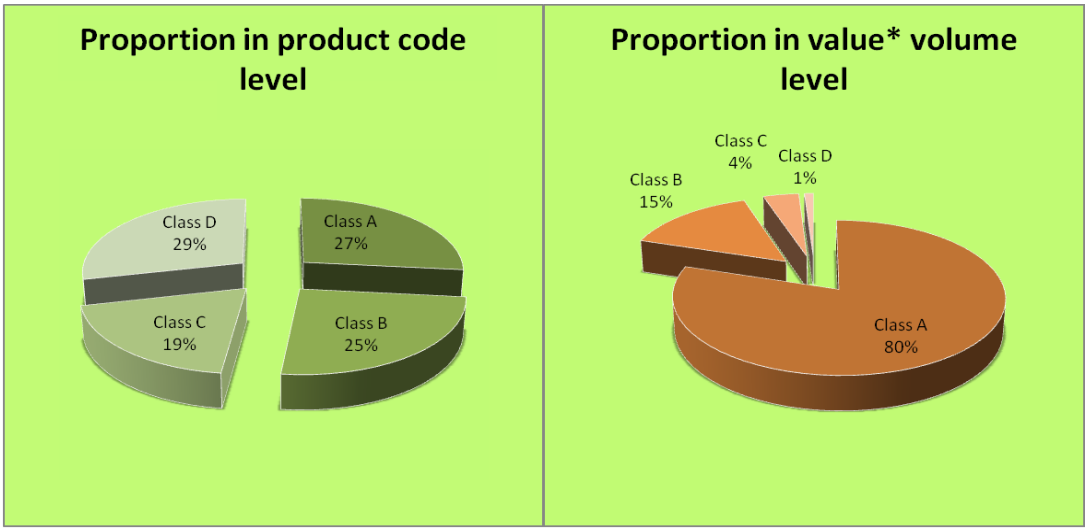


Figure 3.3 One year Classification Result Classes Share

It is shown from figure above that 27% of products in product code level are grouped into class A, which contributes top 80% of sales. Class B includes 25% of product but stand for 15% of sales, while 19% and 29% of products are classified into group C and D respectively.

For the period of 4 months, classification results are shown as below in Table 3.4 and Figure 3.4.

ALL SALES IN VALUE * VOLUME			
CLASS	**Bandwidth of Cumulative Percentage**	**Num of Product**	**Proportion**
A	[0,80%]	597	17%
B	[80%,95%]	685	20%
C	[95%,99%]	697	20%
D	[99%,100%]	1458	43%
TOTAL	ALL	3437	100%

Table 3.4 Four-month Classification Result

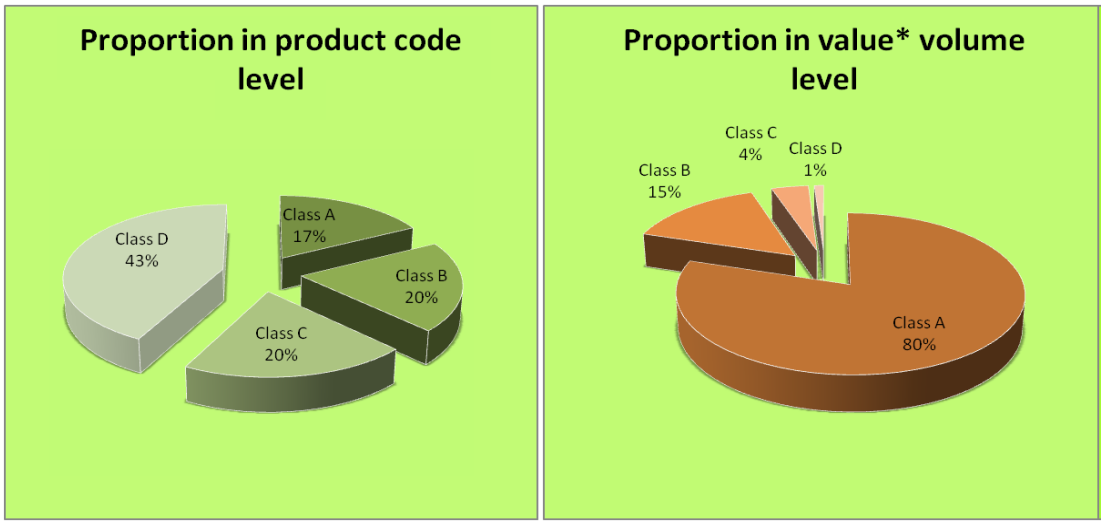
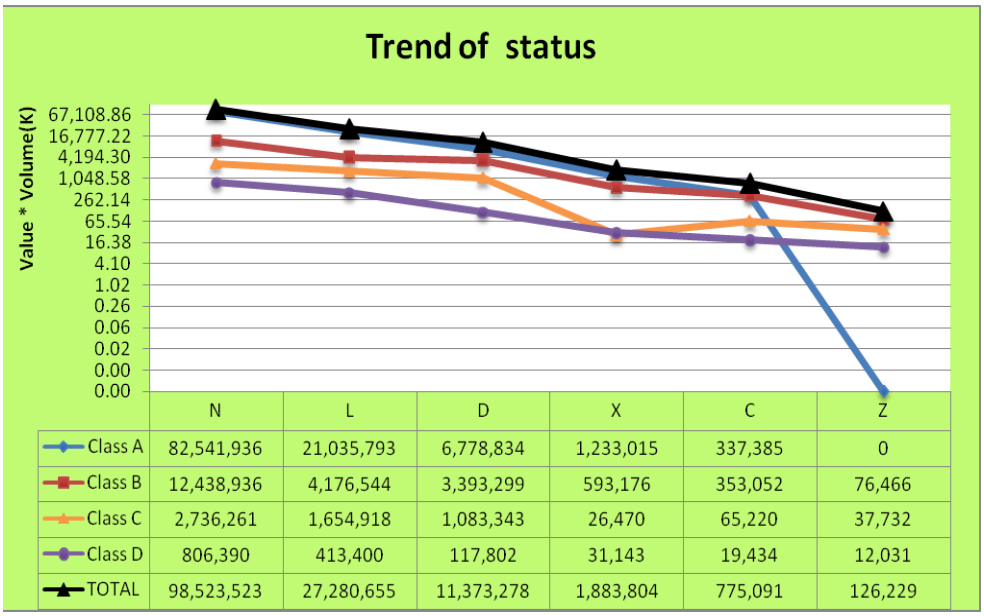


Figure 3.4 Four-month Classification Result Classes Share

It is shown from figure above that 17% or about 600 products are grouped into class A, which contributes top 80% of sales. Class B includes 20% of product but stand for 15% of sales. The rest two classes include about 63% of products in product code level.

Under comparison results for time horizon of 4 months and one year, 'significant few'[13]products of one year are more than 4 months, since class A occupy 27% in product code level of one year while 17% of 4 months. At the same time, 'trivial many'[13] C and D products of one year are less than them of 4 months. So we can see forecasting department even the organization has good expectation of marketing performance in long term.

Besides for above consequence, quantified analysis for criteria of Sale contribution can also give an alternative solution to importance ranking of product status. In this case, weight of product status can be influenced by contribution to sale from different status. Hereby, forecasting report of 4 months is used to illustrate the trend of product status in terms of sale contribution in Figure 3.5.



	N	L	D	X	C	Z
Class A	82,541,936	21,035,793	6,778,834	1,233,015	337,385	0
Class B	12,438,936	4,176,544	3,393,299	593,176	353,052	76,466
Class C	2,736,261	1,654,918	1,083,343	26,470	65,220	37,732
Class D	806,390	413,400	117,802	31,143	19,434	12,031
TOTAL	98,523,523	27,280,655	11,373,278	1,883,804	775,091	126,229

Figure 3.5 Trend of Product Status in terms of Sale contribution

Ongoing products (N) always contribute the big part of sale, while Pop-up (X), Corporate (C) and Zombie (Z) occupy less proportion of sales. In this case, N is more important than other products.

3.3. Catalogue Elements

3.3.1. Criterion Description

Catalogue-element is an available classification method in Oriflame, specifically used in Catalogue Planning department. Catalogue elements distribution is visible for both employees and sale consultants once catalogues are printed. The fact can't be denied that diversifying elements influence and motivate sale consultants, not at the same level. E.g. products for platform or back cover are always drawing much attention of sale consultants. As a result, products located in different sections of catalogue elements play different roles in terms of business strategic and market share, etc. There are no 'written' rules although it can be agreed that common rules among catalogue planners within the organization. The following paragraphs are explanation for catalogue elements in detail.

Platform is located within the first 20-22 pages of catalogues and created as key section by categories. In general, supper launches spread here. The platform is required to gain approximately 20% of sale in every campaign.

Middle spread is positioned behind platform and comprises high value item organized by categories.

Ending section consists of a number of products with low value, which are identified as unit mover. Aside from cheap products, new launches are placed in end section.

Back cover: On average, there is one series of products located. The items are recognized as unit mover for Oriflame. Back cover is required to generate about 2% ~ 5% sales in every campaign.

Catalogues include other optional sections like catalogue driver, catalogue opener of each category, SMS, etc.

Since there is no written and fixed rule for catalogue elements and importance level of catalogue elements have never been specified in Oriflame before, impact of different catalogue-elements on supplying policy and inventory policy is ignored to some extend and never emphasized among planners. Hereby criterion with respect to catalogue-element is identified for Product classification system. As a result, product as critical catalogue-element are identified to be class A products drawing most attention of planners and supplying and inventory plan for them are required to make strictly and more accurately.

Except for catalogue-elements, there are other sorting methods within catalogue planning department. With respect to position in catalogues, product can be grouped as BC (on back cover), FP (alone on one page), SP (alone on one spread), FPO (on one page with other products) and SPO(on one spread with other products). In terms of offer type, product can be featured in manner of Price splash, Purchase with purchase and so on. Offer types are changing with different markets, due to dynamical currency rate or market condition. These filters are not applied extensively all over the organization. Most importantly, the conclusion, that it exist the direct link between offer type or position type and unit moving speed or sale contribution, can be drawn. Among a lot of consideration for supplying plan, planner care much about what product is strategic important and what kinds of product contribute to sale increase and quantity moving.

3.3.2. Calculation

Comparison Matrix

There are no written rules for catalogue-element and weight of different catalogue-elements is not identified in Oriflame. Catalogues are in general designed by employees manually. Hence the first step is to specify or weight catalogue-elements on basis of catalogue planner's experience and preference. How to specify the subjective preference can be handled with the Analytic Hierarchy process, which is widely known as effective tool for problems of multi-objective decision making and weighting of multiple criteria.

In order to specify importance level of catalogue-elements, the step to identify items of comparison matrix is compulsory. Since some elements must be included while other elements are optional and a number of products are not featured in catalogues, the items for comparison matrix are Platform, Back Cover, Ending Section, Middle Spread, Other Section and No offer. Then Do the comparison among pair wise of catalogue elements using 1-9 scale. Among the scale, the value of 9 represent one item is extremely important compared with another item and the value of 1 stand for two items within one pair have the same importance level.

The Table 3.5 is required to fill based on the catalogue planners' experience and preference. Here the result is aggregated and shown below.

Catalogue Elements	Platform	Back Cover	Ending Section	Middle Spread	Other Sections	No Offer
Platform	1	1	2	7	7	9
Back Cover	1	1	2	7	7	9
Ending Section	1/2	1	1	7	7	9
Middle Spread	1/7	1/7	1/7	1	1	9
Other Sections	1/7	1/7	1/7	1	1	9
No Offer	1/9	1/9	1/9	1/9	1/9	1

Table 3.5 Comparison Matrix

Consistency analysis

Let "A" denote the comparison matrix and "n" is the matrix size: 6. only if the Eigen value "λ" satisfy the formula A*w= w*λ, Matrix A is consistency. By solving the delta (λ*I- A) = 0, get λ_{max}=7.336

Then use test statistic,

Consistency index= C.I. = (λ_{max}-n)/ (n-1) = (7.336-6)/ (6-1) =0.2672

Referring to Saaty in 2005, the value of randomly index for matrixes of size 1, 2…10 can be found. Check Table 3.5

For 6 * 6 matrix, R.I. = 1.25, then consistency ratio=C.R. = C.I. / R.I. = 0.2672/1.25=0.2138 > 0.1.

In conclusion, since C.R. is not less than 0.1, the comparison matrix is consistent and reliable.

It is the fact that platform and back cover have high important level with comparison of other items in Matrix. Then after average weight calculation and normalized calculation, the overall weight of items and proposal of classification with respect to catalogue-elements is gained in the Table 3.6.

Catalogue Elements	Platform	Back Cover	Ending Section	Middle Spread	Other Sections	No Offer	Average Weight	Normalized Weight	Class
Platform	1	1	2	7	7	9	3,0968	0,31	A
Back Cover	1	1	2	7	7	9	3,0968	0,31	A
Ending Section	½	1	1	7	7	9	2,4579	0,25	B
Middle Spread	1/7	1/7	1/7	1	1	9	0,5451	0,055	C
Other Sections	1/7	1/7	1/7	1	1	9	0,5451	0,055	C
No Offer	1/9	1/9	1/9	1/9	1/9	1	0,1602	0,02	D

Table 3.6 Overall weights of Catalogue Elements

3.3.3. Classification Result

According to AHP comparison Matrix, different classes and their weight can be gained in Table 3.7.

Class	Catalogue- Elements	Weight
A	Platform / Back Cover	0.62
B	Ending Section	0.25
C	Middle Spread / Other Sections	0.11
D	No Offer	0.02

Table 3.7 Catalogue-Elements Weight

Oriflame operates 17 catalogues in one year and change catalogues every 3 or 4 weeks globally. Hereby we mainly consider the frequency of CIS and EMEA region, because these two regions contribute to the main market share of products. Every 3 weeks products are features as different catalogue-elements. How to classify with respect to different time horizon, 2 months, 4 months, 6 months or one year? Due to endogenous value of products with respect to catalogue-elements, value of products will be combination of values of each campaign within specific time horizon.

For the period of 2 month, maximum and minimum value of product with respect to catalogue-element is 0.62 and 0.02 respectively, as other period of 4 month, 6 month and one year. If product xxxx are always featured as platform or back cover, the weight is 0.62 and if it is always not featured in catalogues, the overall weight is 0.02. The results are shown in Table 3.8 as below.

	Product ID	Campaign 1	Campaign 2	Campaign 3	Weight
Maximum Weight	xxxx	0.62 (Platform / Back cover)	0.62 (Platform / Back cover)	0.62 (Platform / Back cover)	0.62
Minimum Weight	xxxx	0.02 (No offer)	0.02 (No offer)	0.02 (No offer)	0.02

Table 3.8 Catalogue Elements Weight in long term

With consideration of different time horizons, products value with respect to catalogue-elements locate at 4 interval, which are [0, 0.02], (0.02, 0.11], (0.11, 0.25] and [0.25, 0.62].

In terms of catalogue-elements, the proposed classification covering multiple campaigns can be done like the following in Table 3.9:

Class	A	B	C	D
Weight Bandwidth	(0.25, 0.62]	(0.11, 0.25]	(0.02, 0.11]	Equal to 0.02

Table 3.9 Catalogue-Elements Weight Bandwidth

With respect to criterion of catalogue-element, score of products is calculated based on related catalogue plan and weight of related catalogue-element. Since catalogue plans of products are generated for different regions and there are 4 regions like CIS, LA, EMEA and Asia in Oriflame, here product score of catalogue-element is calculated as the maximum of regional scores of catalogue-element. In fact, sale proportions of different regions are not even, among which CIS accounts for the most shares. Although some region takes up small share, it is still very important to Oriflame strategic development.

Let S_{LA}, S_{EMEA}, S_{CIS} and S_{Asia} denote product scores of different regions with respect to catalogue-element, then overall score S is calculated as Maximum (S_{LA}, S_{EMEA}, S_{CIS} , S_{Asia}). At high level, catalogue plans of different regions are required to keep consistent. However, some small adjustment happens in certain regional plan. This kind of adjustment is formed according to related customer reflection.

3.4. Super Launch

3.4.1 Criterion Description

Marketing defines new products to be super launch or non-super launch. In Oriflame, there are 4 critical criterions supporting classification for new super launches. Most importantly, only when forecasting sale of specific item reaches more or less € 2 million in first campaign or € 5 million in one year, it can be regarded as super launch. Other indicators include launch importance, strategic importance and investment level which are shown in Table 3.10.

Criteria *in order of decreasing importance*	**Description**
Net Sale	Estimates sales value of the product (in € M) First campaign>€2.0M Annual sales>€5.0M *Most important criteria* for classification of new projects
Launch Importance	Launch and re-launch of a major brand; Potential to become a major new brand in the company? (top 20)
Strategic Importance	Hype, word-of-mouth or special attention given to the product (to the sales force); Entry into a new product segment or driving growth in a key market segment;
Investment Level	Significant level of investment undertaken for specific product: Investments cost >€100k

Table 3.10 Super Launch Criteria

3.4.2 Utilization

With respect to this criterion, products can be divided into 2 classes like super launch and non-Super Launch. As mentioned above, classification method already exists and is applied in Oriflame. In addition, list of super launch is emphasized time after time and draw much attention every year. Super launch brings much benefit and potential development In Oriflame. Whether products are super launch or not is decided when they are developed by NPD department.

Hereby, products would not be classified again under this criterion, while definition refer to launch type is input into Product Classification for supply planning department.

3.5 Out of Selection

Forecasting Performance

Forecasting Performance is on low level with large range of forecast error in Oriflame. In addition, the forecast performance is changed by different time horizons. Although the supply chain operation is highly relied on forecast, it's still hard to propose the quantified bandwidth and improve the forecast accuracy after PCS implementation. Hence, forecast performance will be excluded out of multi-criteria selection.

Distribution Lead Time

The distribution lead time from suppliers to hubs is the bottleneck in supply chain, yet it is found that suppliers with long lead time from Asia are usually MTO (made to order) with short lifecycle. Hence supply planning need just place one order per year and multi-source the components from a backup European supplier of MTS (made to stock) products. Moreover, lead Time data are difficult for the huge product family to analyze and to some extent fixed by particular suppliers by their own production capability, thus it's hard to group and set the priority of supplier selection. It is therefore proposed to exclude from PCS. Though, the output of PCS is suggested to be tested in Global Supply and Purchasing department, planners could select the strategic supplier with shortest Lead Time of high classification priority firstly.

Production Capacity

Production capacity is specified by internal suppliers but subjectively decided by external suppliers which are difficult to measure and control. While SPIC and PIP are to some extent limited by components, suppliers' facility and capability that decrease flexibility of planning prioritization. Hence, it is decided to exclude production capacity, SPIC and PIP from PCS. However, the output of PCS would be applied in supply planning as planners' check points.

3.5.1 Forecast performance

Criteria description

Forecasting is a prediction of potential demand for certain products. Forecasting is a very challenging and difficult work in Oriflame, since several factors such as the direct sell mode by catalogue window and the complexity of offers layout in different catalogues impact much on forecast process and its performance.

For the reason that forecasting results are highly relied by several relevant departments, especially for supply planning department, that is, the output of forecast results in categories and product status levels are the references for supply plan making. To look how volatile the forecast is and to find out relations between forecast performance and product status as well as categories, forecast performance should be taken into consideration as criteria in PCS in order to set hierarchy and priority for supply planning.

In Oriflame, forecast is measured by Forecast Accuracy as a KPI (Key performance indicator). Due to the large range of forecast deviation in the product portfolio, Percentage Forecast Error will be calculated and applied in further quantified analysis.

Calculation

Method and Formula

Basic concepts for the calculation include formula of the absolute deviation and the percentage forecast error which are illustrated as below.

Absolute Deviation: $\mathrm{FE} = \mathrm{A_i} - \mathrm{F_i}$

$$\mathbf{AD} = \sum_{\mathbf{i=1}}^{\mathbf{n}} |\mathbf{A_i} - \mathbf{F_i}|$$

Forecast Accuracy: $$\mathbf{Error\ (\%)} = \frac{\mathbf{1}}{\mathbf{n}} \sum_{\mathbf{i=1}}^{\mathbf{n}} \left| \frac{\mathbf{A_i} - \mathbf{F_i}}{\mathbf{F_i}} \right| \times \mathbf{100\%}$$

$$\mathrm{FA} = 1 - \mathrm{Error}\ (\%)$$

Absolute deviation

The actual sales demand is compared with forecasted demand by product family, hence forecast error is right the deviation of these two numbers, and the absolute deviation is achieved by summing of all the absolute forecast error value for every fitted or forecast point on product item level.

Forecast accuracy

The sum of the item level absolute deviations is divided by the sum of the item level forecasts and multiplied by 100%. This calculation provides a percentage of the mix deviation by family and it is called Percentage Forecast Error. The converse of the Error is the measurement of the Forecast Accuracy[16].

After the calculation of Percentage forecast error (PFE) for the product family on product code level, two filters including product status and category are selected to generate the ranking and analyze the quantified relation between the grouped results and forecast performance.

Procedures

Data resource

Forecast reports from forecasting department are extracted for calculation. The Excel table of data on product code level with detailed information involved category, product status, NPD launch date and global discontinuation date (GDD) is applied in quantified analysis.

Time horizon

Annual forecast in accordance with annual business goal on top level and four month forecast which in line with Global forecasting referred by supply planning department are chosen as the two time horizon for comparison.

To compare the actual demand with forecasted demand and calculate percentage forecast error, two forecast reports are necessary. One is the monthly display forecast report in January 2009 in which forecasting data for the whole year are used, another is the same report generated from January 2010 in which we can get the sales data as a historical data resource of year 2009 to compare with.

Elimination of non-sense data

Since the forecast report keep all the product code from years before until now, for the annual calculation, some code with GDD before January 2009 should be eliminated to decrease the load of calculation. The same condition happened in four months calculation, thus product code with GDD before September 1st 2009 should also be ignored.

After the elimination of non-sense out of date product code, 2080 product codes remain in forecast results and 2544 codes left with sales demand data.

Match work for Absolute deviation calculation

From the above elimination, we found that the total amount of product code of sales data is more than that of forecast data. Hence, match work need to be done to

continue the comparison and calculation. Here, ‘‘VLookup’’ function in Excel give aid to the match work.

Absolute deviation (AD) calculation

Monthly absolute deviation is calculated for the whole year 2009 since the report is developed by month. Furthermore, averages of the monthly AD within one year and four months’ time horizon are calculated respectively for all the matched product code.

Percentage forecast error calculation

Use the formula stated in Method and Formula paragraph, we got the available results for most of product code with sales data. However the formula itself has limitation when dealing with forecast data with the value ‘zero’, the condition lead to a ‘divided by zero (#DIV/0!)’ error in Excel cells. So we need to eliminate the abnormal data after calculation for annual and four months’ time horizon.

Cumulative percentage calculation

Rank the percentages forecast error data in descending sequence, and then calculate the cumulative percentage, which is the first percentage plus the second percentage, and so on. A detailed example is shown as below in Figure 3.6.

1	CODE	CATEGORY	Status	ANNUAL MAPE-O	Sum AnnMAPE	Accum %
1046	12549	OTH	L	320222.61%	1942389.99%	16.5%
1047	16572	ACC	L	116938.48%		22.5%
1048	4714	OTH	C	36900.00%		24.4%
1049	16573	ACC	L	26222.65%		25.8%
1050	16493	ACC	L	24116.98%		27.0%
1051	13470	TOI	N	23772.97%		28.2%

Figure 3.6 PFE Calculation Sample

From the table, we can see the first cumulative percentage is the annual percentage forecast error divided by the sum of annual percentage forecast for all the available product codes. Then from the second line, the result is the sum of the first two annual percentage forecast divided by the sum annual PFE. After that, we gather the data from the cumulative percentage account for top 80% according to the Pareto theory as ‘‘A’’ class to analyze.

Data analysis

The final data analysis of Forecast performance including three parts:

- Ranking and share of Product status with the top 80% cumulative percentage of PFE
- Ranking and share of Categories in with the top 80% cumulative percentage of PFE
- Trend of PFE with Product status within each category in quantity

Results

Ranking and share of product status are shown in Table 3.11, 3.12 and Figure 3.7 respectively.

Status	Count	Total	Percentage	Proportion
L	150	151	99.3%	10.0%
X	7	9	77.8%	0.5%
Z	17	23	73.9%	1.1%
C	7	10	70.0%	0.5%
D	139	322	43.2%	9.3%
N	329	985	33.4%	21.9%

Table 3.11 Quantity of Annual PFE with Product Status in Top 80%

Status	Count	Total	Percentage	Proportion
X	5	5	100.0%	0.4%
L	51	52	98.1%	4.1%
D	70	219	32.0%	5.6%
N	235	961	24.5%	18.9%
C	0	5		
Z	0	0		

Table 3.12 Quantity of Four-Month PFE with Product Status in Top 80%

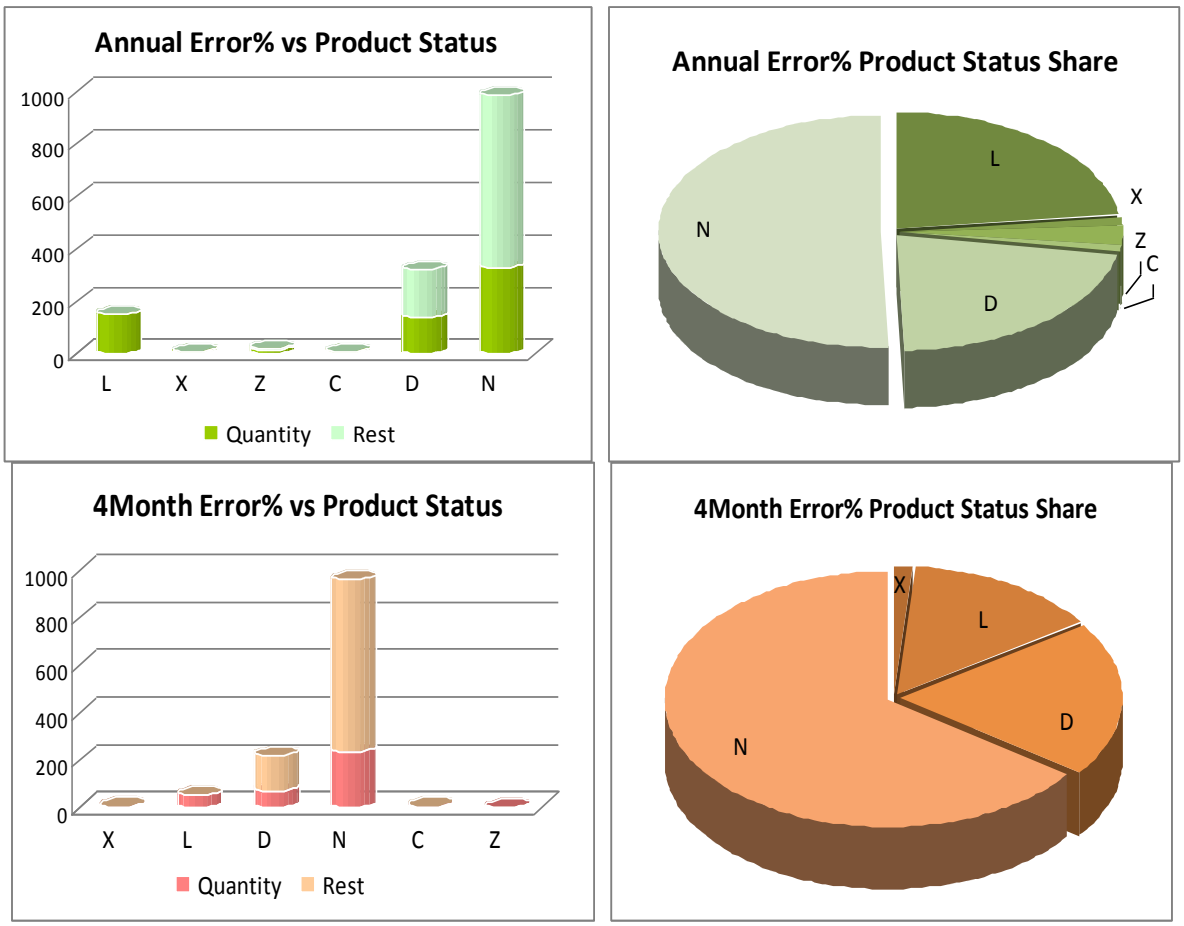


Figure 3.7 PFE with Product Status: Barchart and Share piechart

From Table 3.11, ranking of product status is achieved after calculation of percentage of every status take account in their total amount. In which, L status is account super high percentage within all the L codes with large forecast error, while X, Z and C are in the medium forecast error level. Obviously, N codes give the least proportion with high forecast level.

From Table 3.12 and Figure 3.7, differences between the two time horizons are manifested. X and L take the largest percentage value in all the X and L codes with high PFE. Whereas, within the top 80% range, we didn't found C and Z codes, so the four months results are not adequate to compare with annual results or we may say that C and Z are in the stable level during forecast with a reasonable forecast error.

In conclusion, N, L and D codes share the most part in the product family with a high percentage forecast error. However, we cannot judge the ranking of product status from the comparison between annual and four months PFE quantified analysis results since the ranking and data source are different. The only product status we

know for sure is that L products always have a high forecast error and hard to forecast.

Ranking and share of categories are shown in Table 3.13, 3.14 and Figure 3.8 respectively

Category	Count	Rest-C	Total-C	Percentage	Proportion
ACC	141	40	181	77.9%	9.4%
OTH	15	7	22	68.2%	1.0%
WELL	6	3	9	66.7%	0.4%
FRA	58	58	116	50.0%	3.9%
CCS	255	343	598	42.6%	17.0%
TOI	108	188	296	36.5%	7.2%
SKC	66	212	278	23.7%	4.4%

Table 3.13 Quantity of Annual PFE with Categories in top 80%

Category	Count	Rest-C	Total-C	Percentage	Proportion
ACC	47	25	72	65.3%	3.8%
OTH	5	8	13	38.5%	0.4%
TOI	85	169	254	33.5%	6.8%
FRA	30	74	104	28.8%	2.4%
SKC	62	191	253	24.5%	5.0%
CCS	131	406	537	24.4%	10.5%
WELL	1	8	9	11.1%	0.1%

Table 3.14 Quantity of Four Months PFE with Categories in top 80%

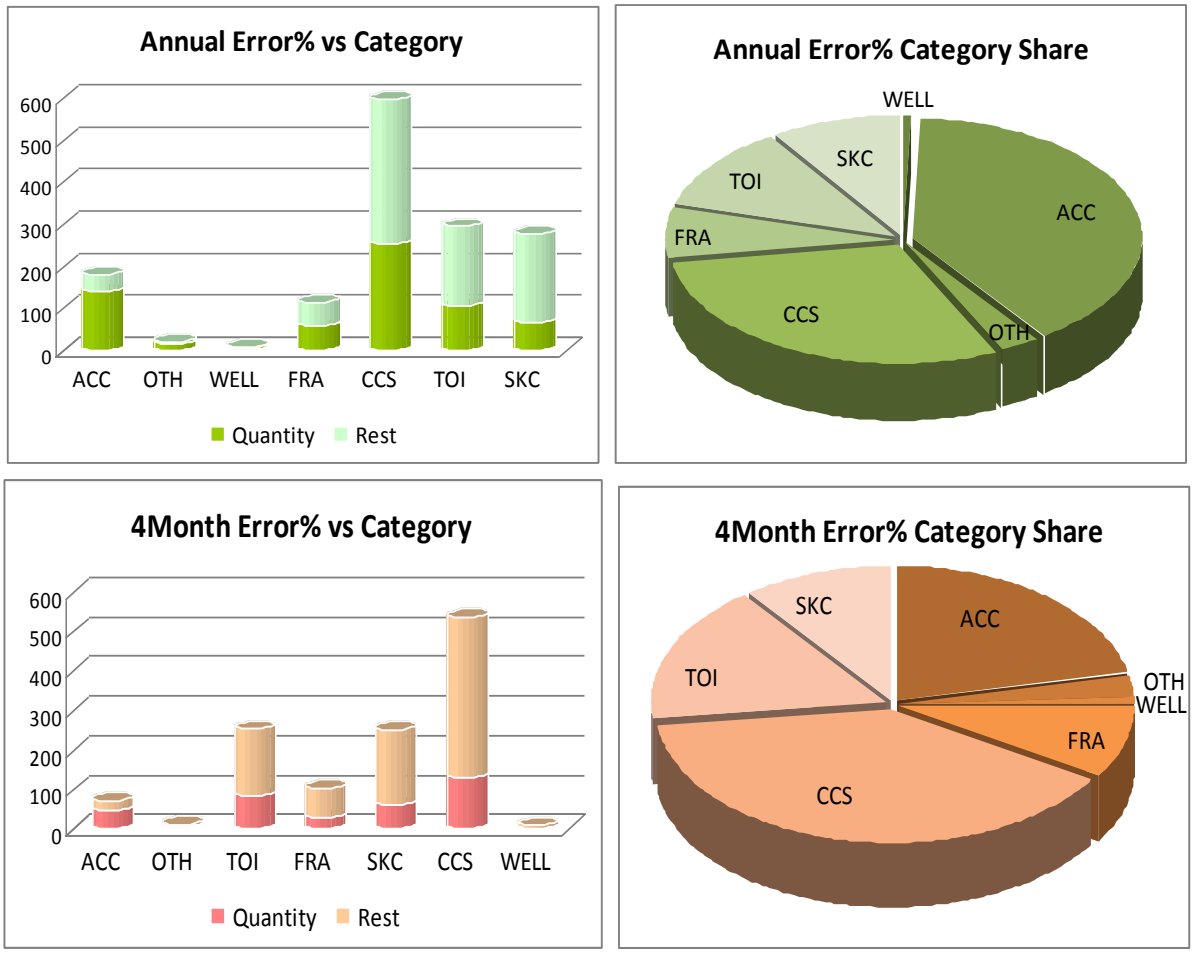


Figure 3.8 PFE with Category: Barchart and Share piechart

As can be seen above, same condition happened in Accessories and Other categories in the two time horizons with high percentage of high PFE. While Color Cosmetics, Accessories and Skin Care share the most part in the product family which keeps alignment with the quantity share of product codes for these three categories itself. In addition, CCS takes the largest part no matter in the annual and four months results with high PFE.

Trend of PFE with product status within each category are shown in Table 3.15, 3.16 and Figure 3.9 respectively.

Product Status	ACC	OTH	WELL	FRA	CCS	TOI	SKC
L	102	1	0	7	31	6	3
X	2	0	0	0	2	0	3
Z	16	0	0	0	0	1	0
C	1	6	0	0	0	0	0

D	1	2	0	8	68	38	22
N	19	6	6	43	154	63	38

Table 3.15 Quantity of annual product status and categories with top 80% PFE

Within Category	ACC	OTH	TOI	FRA	SKC	CCS	WELL
X	1	0	0	0	3	1	0
L	28	0	1	4	2	16	0
D	1	1	27	4	17	20	0
N	17	4	57	22	40	94	1

Table 3.16 Quantity of four months product status and categories with top 80% PFE

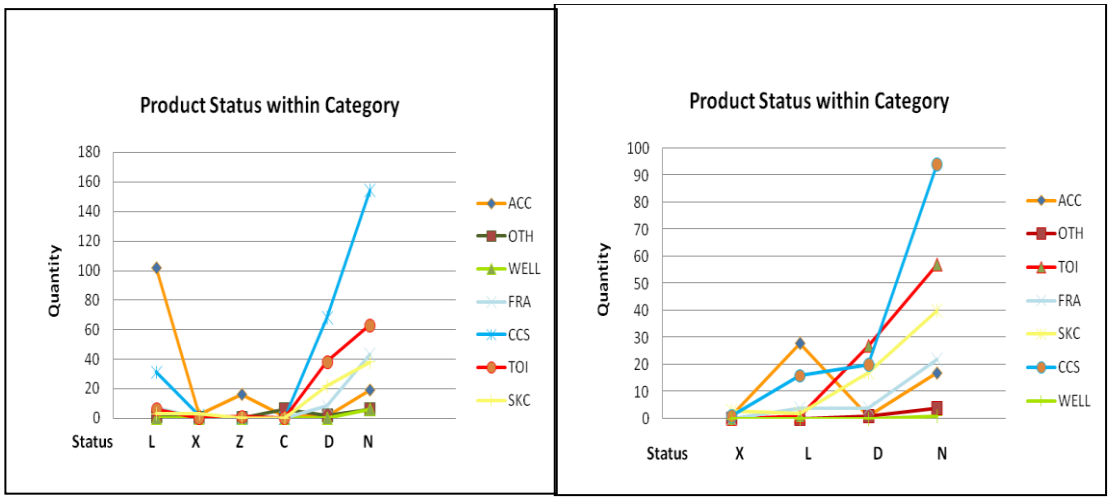


Figure 3.9 Quantity of Product Status within Categories with top 80% PFE

From Table C-5, Table C-6 and Figure C-3, we can directly get a trend view of the product status, in which, L, D and N products have the large quantity of high PFE value in the top 80% range. One thing interesting is that CSS has extremely high quantity with high PFE among all the product status.

According to the results, we may group the product status of three different forecast error level, that is, L and X, Z and C, as well as D and N, which represent high, medium and low forecast error level.

Conclusion

Although the PFE quantified analysis results generated grouped results according to the ranking of product status from high PFE value to low as the forecast error level, the data are not adequate and accurate. Moreover, the complexity of product offers, the large range and difference of forecast error value lead to the difficulty to apply Forecast performance as criteria in PCS. Hence, we decide to exclude Forecast performance from the multi-criteria table but just take as a reference in future analysis.

3.5.2 Lead Time

Criteria description

Lead time (LT) in Oriflame Supply Planning is the time period from order placed for suppliers to product received in hubs. According to VSM analysis, the bottleneck is the distribution time from supplier to Global Distribution Centers.

The importance within the LT period are the conversion time of order from product to GDC, supplier constraints for raw material and components, and freeze duration of suppliers.

Calculation

Method

To set the threshold of lead time in quantity, it is necessary to analyze the lead time data from long period to short. After that, ranking of lead time data is help to set the threshold for different suppliers.

Procedures

- Data resource

The lead time data is sourced from 2010 logistic information in Excel format document and provided to Supply planning department. Since the Venlo GDC will be closed down by the end of 2010, hence it won't be included into quantified analysis.

- Data analysis[17]

Supplier	Country	Delivery Time
1	CHINA	42
2	CHINA	42
3	CHINA	42
4	CHINA	42
5	CHINA	42
6	TAIWAN, REPUBLIC OF CHINA	42
7	INDIA	37
8	INDIA	37
9	UNITED STATES	35
10	FRANCE	4
11	SPAIN	4
12	FRANCE	4
13	ITALY	4
14	ITALY	4
15	ITALY	4
16	ITALY	4
17	ITALY	4

18	UNITED KINGDOM	3
19	UNITED KINGDOM	3
20	FRANCE	3
21	UNITED KINGDOM	3
22	FRANCE	3
23	SWITZERLAND	3
24	FRANCE	3
25	FRANCE	3
26	LUXEMBOURG	3
27	FRANCE	3
28	FRANCE	3
29	FRANCE	3
30	RUSSIA	3
31	FRANCE	3
32	UNITED KINGDOM	3
33	UNITED KINGDOM	3
34	UNITED KINGDOM	3
35	UNITED KINGDOM	3
36	FRANCE	3
37	FRANCE	3
38	FRANCE	3
39	RUSSIA	3
40	SWITZERLAND	3
41	GERMANY	2
42	GERMANY	2
43	HUNGARY	2
44	NETHERLANDS	2
45	SWEDEN	2
46	AUSTRIA	2
47	GERMANY	2
48	SWEDEN	2
49	BELGIUM	2
50	GERMANY	2
51	SWEDEN	2
52	GERMANY	2
53	GERMANY	2
54	GERMANY	2
55	POLAND	1
56	POLAND	1
57	POLAND	1
58	POLAND	1
59	BELGIUM	0
60	CHINA	0
61	UNITED KINGDOM	0
62	POLAND	0
63	FRANCE	0
64	FRANCE	0

Table 3.17 Transportation Lead Time of Global Suppliers

Results

As seen in Table 3.17, suppliers from Asia and US have much longer transportation time to GDC which all take 30 days more. Whereas it takes less than one week for suppliers located in Europe to transport.

The transportation time on supplier level can be sorted into two groups geographically. The one is suppliers from Asia and US with transportation time larger than 35 days, while the other is European suppliers with transportation time less than one week.

Conclusion

Since the quantified analysis of lead time has just sorted the suppliers into two groups in general level and actually, products produced by Asian suppliers are usually MTO with one order per year. From the perspective of Supply planning department, they often have the cooperated backup European suppliers of an Asian or American supplier with the same production capability for particular products. With the consolidation in Asian markets, it will eliminate all the suppliers with long lead time. Furthermore, a few of the products can be produced by different suppliers with the same transportation type and time, for the reason that the products attributes limit the selection of suppliers of their capacity.

The selection of suppliers might be complex in terms of transportation cost, time and geographical location, etc. And then it becomes nonsense to involve lead time as a criterion into PCS.

Since Venlo GDC will be closed down by the end of 2010, the data will not be included in the quantified analysis. The lead time quantified analysis results could not help to prioritize supply plan on product code level, thus it will be eliminated from multi-criteria system of product classification.

Application areas of Lead Time data

Although lead time data will not be applied into multi-criteria product classification, they have other application possibilities in stakeholder departments and areas. For instance, purchasing and strategic sourcing department, and balance workload after new GDC completion. Moreover, it is able to align the areas which need to be reviewed or proposed for reduction in lead time.

3.5.3 Production Capacity, SPIC and PIP

Criteria description

Production Capacity

Production capacity in Oriflame is the volume of particular products that can be produced by internal or external suppliers in a given period of time by proper production method with components and ingredients. To some extent, the components, ingredients and manufacturing method usually limit the suppliers' production capacity and different MOQ would be specified based upon their manufacturing facilities.

For internal suppliers, it is specified with capacity parameters which are flexible for supply planning to manage. But for external suppliers, it is more subjective defined of production capacity which are difficult to measure and maintain.

SPIC and PIP

SPIC is applied to classify products in line with related filling method. SPIC is also linked to the Primary Packaging Part in lots of the cases since the components often determine the corresponding filling method for particular products. The description of SPIC categories are shown in Table 3.18.

The PIP is heavily linked to the SPIC since the SPIC will decide which production line the product can be produced on. In addition that PIP as a detailed description of SPIC help to specify the particular component type for suppliers to make production plan[18].

Proposed SPIC	DESCRIPTION
ACCESSORY	Every product where category= Accessory
AEROSOL	Every product where packaging part, primary part= Aerosol
BOTTLE	
BOTTLE EDT	
CARTON	Every product where packaging part; primary part=Carton
COMPACT BASE	Every product where packaging part; primary part=Compact base
CORPORATE	Every product which have the product life = C
JAR	Every product where packaging part; primary part=Jar
JAR/BOTTLE	

LIP SAMPLERS	Every product where segment= LIPST and the SET/Sample= SAM
LIP STICK	Every product where segment= LIPST and the SET/Sample= REGP
MASCARA	Every product where segment= MASC
NAIL VARNISH BOTTLE	Every product where sector = Nail
PENCIL	Every product where primary part = PEN/PLASTIC_PEN OR PENCIL_(WOOD)
ROLL BALL	
SACHET	Every product where primary part= Sachet
SET	Every product where Set/ Sample= NASET or LSET
SLIM STICK	
SOAP BAR	Every product where primary part= Soap Bar
STICK	
TUBE	Every product where primary part = Tube/Cap
VIAL	Every product where primary part= Vial
WRAP	
OTHER	

Table 3.18 SPIC Categories

Analysis

After the overview of product data Excel with product capacity, supplier, SPIC and PIP, it is not supposed to include Product capacity, product category, MOQ, SPIC and PIP into PCS. The reasons are stated in two aspects as below:

- The capacity data are varied in terms of different product category, section, supplier, filling method, SPIC and PIP, thus it's very complicated to classify the capacity in quantity with threshold and set priority of different suppliers.
- Components and production method to some extent limit the suppliers in their own capacity, hence the flexibility to select SPIC is on low level and the capacity with MOQ is fixed for supplier. Supply planner could not change the capacity quantity subjectively; instead, they need to follow the suppliers' characters and make the supply plan.

Conclusion

Production capacity, SPIC and PIP will not include in PCS, however, they are the test areas during the implementation of PCS.

Application procedures of Production capacity, SPIC and PIP

- Check ABCD product classification on product code level and select the critical and important products with higher planning priority
- Check the capacity, suppliers, SPIC and PIP of the selected products
- Find the optimized combination of the attributes in Step 2 and determine the proper supply plan
- Balance the work load of suppliers with similar production facility and capacity
- VSM of super critical products and seek for improvement to smooth supply chain

4. Multiple Criteria Classification Model

Multi-criteria ABC classification has been accepted widely in industry. Oriflame is also aware of single-criterion-classification cannot take all important issues in consideration. Not only benefits but also reputation is important to long term development of each organization. In traditional ABC analysis, items are classified only according to their contribution to annual dollar usage. As a result, high profitable products are always identified as critical items, while low profitable products but with high potential sale are ignored during product management. Single-criterion-classification is not suitable for high developing organization with newness target. This paper introduces two models for multi-criteria-classification including cross-tabulate matrix and AH-model and then goes through pros and cons of each model.

4.1. Cross Tabulate Matrix

4.1.1. Procedure

Use cross-tabulate matrix to build the classification model as following

- Let A_1, B_1, C_1 and D_1 denote four classes of the criterion of sale contribution in value*volume. At the same time, A_2, B_2, C_2 and D_2 represent four classes of the criterion of catalogue-elements
- Build the classification matrix with two criteria in Table 4.1. Four classes for sale contribution are located in rows while another four classes for catalogue-elements are arranged in columns. Except for heads of each row or column, values of each cell are the combined result of related row and column within classification matrix

Criteria: Sale Contribution / Catalogue-Elements	A_2 located at Platform or Back Cover	B_2 located at Ending Section	C_2 located at Middle Spread	D_2 No offer
A_1 contributing to top 80% sale	A_1 A_2 contributing to top 80% sale & located at platform or back cover	A_1 B_2 contributing to top 80% sale & located at ending section	A_1 C_2 contributing to top 80% sale & located at middle spread	A_1 D_2 contributing to top 80% sale & No offer
B_1 contributing to sale interval [80%, 95%]	B_1 A_1 contributing to sale interval [80%, 95%] & located at platform or back cover	B_1 B_2 contributing to sale interval [80%, 95%] & located at ending section	B_1 C_2 contributing to sale interval [80%, 95%] & located at middle spread	B1 D2 contributing to sale interval [80%, 95%] & No offer

C_1 contributing to sale interval [95%, 99%]	C_1 A_2 contributing to sale interval [95%, 99%] & located at platform or back cover	C_1 B_2 contributing to sale interval [95%, 99%] & located at ending section	C_1 C_2 contributing to sale interval [95%, 99%] & located at middle spread	C_1 D_2 contributing to sale interval [95%, 99%] & No offer
D_1 contributing to sale interval [99%, 100%]	D_1 A_2 contributing to sale interval [99%, 100%] & located at platform or back cover	D_1 B_2 contributing to sale interval [99%, 100%] & located at ending section	D_1 C_2 contributing to sale interval [99%, 100%] & located at middle spread	D_1 D_2 contributing to sale interval [99%, 100%] & No offer

Table 4.1 Matrix with Two Criteria

- Classify product by combining two criteria within cross-tabulate matrix shown in Table 4.2. This model simply assigns every item in A1A2, A1B2 and B1A2 into Class A and every item in A1C2, B1B2 and C1A2 into Class B; and every item in B1C2, C1B2 and C1C2 into Class C; every in A1D2, B1D2, C1D2, D1D2, D1A2, D1B2, D1C2 and D1D2 into Class D.

Criteria: Sale Contribution / Catalogue-Elements	A_2 located at Platform or Back Cover	B_2 located at Ending Section	C_2 located at Middle Spread	D_2 No offer
A_1 Contributing to top 80% sale	A_1 A_2	A_1 B_2	A_1 C_2	A_1 D_2
B_1 Contributing to sale interval [80%, 95%]	B_1 A_1	B_1 B_2	B_1 C_2	B_1 D_2
C_1 Contributing to sale interval [95%, 99%]	C_1 A_2	C_1 B_2	C_1 C_2	C_1 D_2
D_1 Contributing to sale interval [99%, 100%]	D_1 A_2	D_1 B_2	D_1 C_2	D_1 D_2

Table 4.2 Proposed Cross Tabulate Matrix

- Propose the classification result with ancillary criterion of super or non-super launch

Classes	Description
A	• Products contributing to top 80% sale & located at Platform or Back cover • Products contributing to top 80% sale & located at Ending Section • Products contributing to sale interval [80%, 95%] & located at Platform or Back Cover • Super launch products
B	• Non super launches contributing to top 80% sale & located at Middle Spread • Non super launches contributing to sale interval [80%, 95%] & located at Ending Section • Non super launches contributing to sale interval [95%, 99%] & located at Platform or Back Cover
C	• Non super launches contributing to sale interval [80%, 95%] & located at Middle Spread • Non super launches contributing to sale interval [95%, 99%] & located at Ending Section • Non super launches contributing to sale interval [95%, 99%] & located at Middle Spread
D	• Non super launches products contributing to sale interval [99%, 100%] or No offer in catalogues

Table 4.3 Classification Output for one campaign

- Refine classification proposal with consideration of longer time horizon. Since every 3 weeks catalogues are updated, products may be located at platform in current catalogue and located at middle spread in next catalogues. The roles of products with respect to catalogue-elements are always not constant. At phase of quantified analysis of catalogue-elements, weights of diversifying catalogue-elements have been gained via AHP tool. As a result, overall weight of each product is calculated as average weight of its dynamic positions for the period of several campaigns. Under criterion of catalogue-elements, classification is done according to the overall weight. The cross-tabulate matrix for classification is adjusted like Table 4.4 and refined classification output shown in Table 4.5

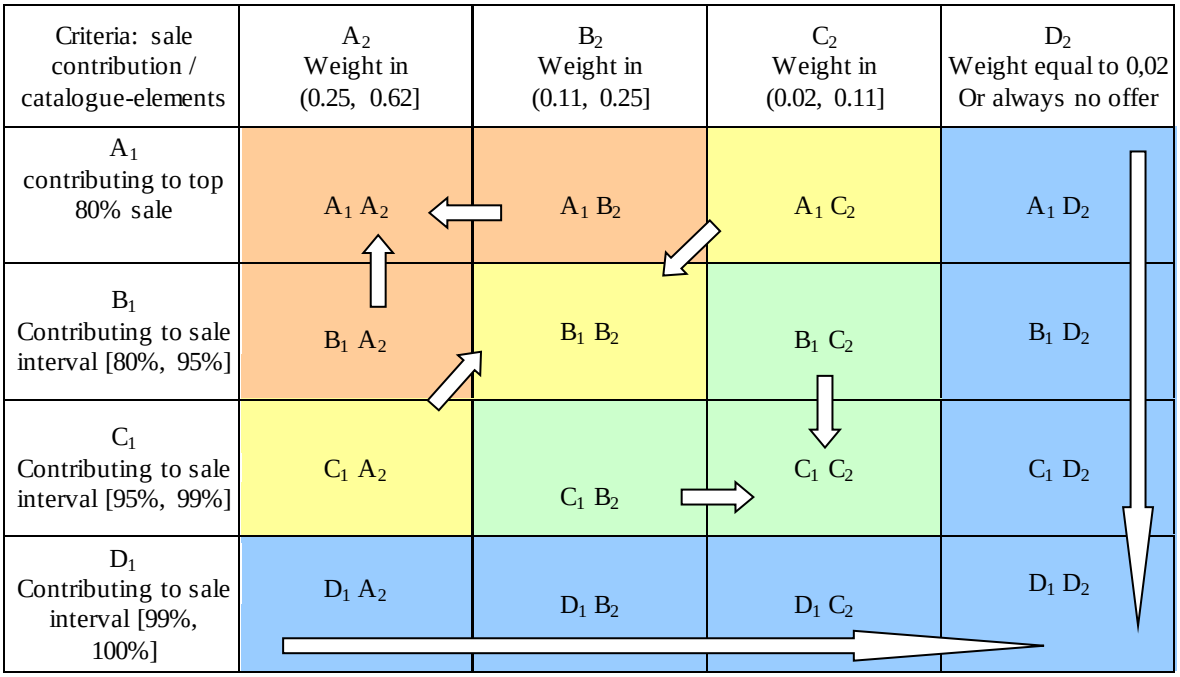


Table 4.4 Adjusted Cross-tabulate Matrix

Classes	Description
A	• Products contributing to top 80% sale & weight in (0.25, 0.62] in terms of catalogue elements • Products contributing to top 80% sale & weight in (0.11, 0.25] in terms of catalogue elements • Products contributing to sale interval [80%, 95%] & weight in (0.25, 0.62] in terms of catalogue elements • Super launch products
B	• Non-super-launches contributing to top 80% sale & weight in (0.02, 0.11] in terms of catalogue elements • Non-super-launches contributing to sale interval [80%, 95%] & weight in (0.11, 0.25] in terms of catalogue elements • Non-super-launches contributing to sale interval [95%, 99%] & weight in (0.25, 0.62] in terms of catalogue elements
C	• Non-super-launches contributing to sale interval [80%, 95%] & weight in (0.02, 0.11] in terms of catalogue elements • Non-super-launches contributing to sale interval [95%, 99%] & weight in (0.02, 0.11] in terms of catalogue elements • Non-super-launches contributing to sale interval [95%, 99%] & & weight in (0.11, 0.25] in terms of catalogue elements
D	• Non-super-launches contributing to sale interval [99%, 100%] or weight in (0.02, 0.11] in terms of catalogue elements (no offer in catalogues).

Table 4.5 Adjusted Classification Output

4.1.2. Pros and Cons:

Easy-to-understand and simple-to-use is one of significant advantages of Cross-tabulate classification model. No complicated mathematic skill is required to do classification. All needed is products' information.

Another critical strength is the model has so transparency process that managers can trace and control classification at high level. The classification path is shown vividly and clearly in matrixes. Besides, this process is flexible to adjust according to certain requirements and employees' preference.

Expected classification outputs have more application. One kind of outputs is four different sets of certain products. Each product is directly linked to certain class. Another output is set of information or description of products belonging to specific class. The conclusion can be easily drawn that super launch products are always in class A. Once the value of product under three criteria is known, the decisions that which class it belong to can be done.

However, classification of cross-tabulate is not flexible to some extent. It is said in literatures that this model is much suitable for classification with 2 primary criteria. The complexity is increasing and accuracy is decreasing while continuously introducing new criteria in to classification. Secondly, this model doesn't take the weight of criteria into consideration, which means that classification relies on each criterion at the same level and the importance level of criterion is not different. In the case that tries to introduce certain more important or less important criteria, it is not proper to apply the cross-tabulate matrix.

4.2. Operation Research Program: AH-model

In AH- model, product classification system includes three criteria: sale contribution in volume*value, catalogue-elements and super/ non-super launch. In the chapter of quantified analysis, there is detailed classification with respect to these three criteria. The individual classifications aren't supposed to include in AH-model, while contribution value of products with respect to three criteria are converted to be within 0-1scale and summarized into overall score, according to which products are classified. In addition, the criterion of super/ non-super launch is taken as rather ancillary but primary criterion like sale contribution and catalogue-elements.

4.2.1. Procedure

- Convert all value into 0-1 scale with transforming formula of NG-model

$$\frac{y_{ij} - \min_{i=1,2,\dots,j}\{y_{ij}\}}{\max_{i=1,2,\dots,j}\{y_{ij}\} - \min_{i=1,2,\dots,j}\{y_{ij}\}}$$

  In which, y_{ij} denotes the value of product i with respect to criterion j.

- Build multi-criterion product classification model like AH-model

$$\max \ S_i = \sum_{j=1}^{J} s_{ij} w_j \ ,$$

$$s.t. \quad \sum_{j=1}^{j} w_j^2 = 1,$$

$$w_j \geq 0, j = 1, 2, \dots, J.$$

  Since A. Hadi-Vencheh has solved this program and got solution as

$$w_j^* = \frac{s_{ij}}{\sqrt{\sum_{j=1}^{J} s_{ij}^2}}, j = 1, 2, \dots, J.$$

  And this part won't spend much to solve the problem by using AH' solution.

- Calculate overall score of each product and arrange all products in descending order according to overall score in EXCEL. A sample of 20 products shown in Table 4.6 is used to explain the procedure.

Code	Criterion 1: sale contribution	Criterion 2: Catalogue-elements	Criterion 3: Super / Non-super launch	Transformed criterion 1	Transformed criterion 2	Transformed criterion 3	Over score
21669	281493,03	0,62	1	1	1,03	1	1,752
22135	86962,59	0,62	1	0,31	1,03	1	1,471
21542	29270,85	0,62	1	0,1	1,03	1	1,442
21578	18367,92	0,62	1	0,07	1,03	1	1,439
21711	13218	0,62	1	0,05	1,03	1	1,439
21577	552,12	0,62	1	0	1,03	1	1,438
21706	209722,35	0,11	1	0,75	0,18	1	1,261
21452	30418,31	0,11	1	0,11	0,18	1	1,022
21545	23432,1	0,11	1	0,08	0,18	1	1,02
21653	15324,34	0,11	1	0,05	0,18	1	1,018
21452	1515,93	0,11	1	0,01	0,18	1	1,017
21547	210	0,11	1	0	0,18	1	1,017
21589	232550,5	0,25	0	0,83	0,42	0	0,926
22167	163931,46	0,02	0	0,58	0,03	0	0,584
21684	62773,25	0,25	0	0,22	0,42	0	0,473
22186	26049,76	0,25	0	0,09	0,42	0	0,427
21719	16023,04	0,25	0	0,06	0,42	0	0,421
22185	2216,54	0,25	0	0,01	0,42	0	0,417
21709	430,65	0,25	0	0	0,42	0	0,417
21681	29751,15	0,02	0	0,11	0,03	0	0,111
21536	21725,15	0,02	0	0,08	0,03	0	0,084
21548	13999,58	0,02	0	0,05	0,03	0	0,06
21710	1272,04	0,02	0	0	0,03	0	0,034

Table 4.6 Sample Calculation of Overall Score

- Classify products in EXCEL

Hereby, Pareto's rule is applied again to get each class's distribution interval. Since Oriflame runs thousands of products, it is approval to have 4 classes of products in all shown in Table 4.7.

Code	Criterion 1: sale contribution	Criterion 2: Catalogue-elements	Criterion 3: Super / Non-super launch	Transformed criterion 1	Transformed criterion 2	Transformed criterion 3	Over score	Class
21669	281493,03	0,62	1	1,00	1,03	1,00	1,752	A
22135	86962,59	0,62	1	0,31	1,03	1,00	1,471	A
21542	29270,85	0,62	1	0,10	1,03	1,00	1,442	A
21578	18367,92	0,62	1	0,07	1,03	1,00	1,439	A
21711	13218,00	0,62	1	0,05	1,03	1,00	1,439	A
21577	552,12	0,62	1	0,00	1,03	1,00	1,438	A
21706	209722,35	0,11	1	0,75	0,18	1,00	1,261	A
21452	30418,31	0,11	1	0,11	0,18	1,00	1,022	A
21545	23432,10	0,11	1	0,08	0,18	1,00	1,020	A
21653	15324,34	0,11	1	0,05	0,18	1,00	1,018	A
21452	1515,93	0,11	1	0,01	0,18	1,00	1,017	A
21547	210,00	0,11	1	0,00	0,18	1,00	1,017	A
21589	232550,50	0,25	0	0,83	0,42	0,00	0,926	B
22167	163931,46	0,02	0	0,58	0,03	0,00	0,584	B
21684	62773,25	0,25	0	0,22	0,42	0,00	0,473	B
22186	26049,76	0,25	0	0,09	0,42	0,00	0,427	B
21719	16023,04	0,25	0	0,06	0,42	0,00	0,421	B
22185	2216,54	0,25	0	0,01	0,42	0,00	0,417	C
21709	430,65	0,25	0	0,00	0,42	0,00	0,417	C
21681	29751,15	0,02	0	0,11	0,03	0,00	0,111	D
21536	21725,15	0,02	0	0,08	0,03	0,00	0,084	D
21548	13999,58	0,02	0	0,05	0,03	0,00	0,060	D
21710	1272,04	0,02	0	0,00	0,03	0,00	0,034	D

Table 4.7 Sample Calculation Output

4.2.2. Pros and Cons

AH-model is flexible with no limitation to the number of criteria. The solution won't become more complicate and difficult with criteria's increasing. As a result, classification criteria can be adjusted according to users' requirement and preference. In particular, when the organization is developing continuously, AH-model is proper to catch the changing precondition and requirement of classification.

In another aspect, AH-model has covered the different impact on classification result from diversifying criteria. Sometimes specific product is more important with respect to one criterion and less important for other criteria. In this case, in model of cross tabulate matrix, this product will be grouped into bottom class while this product is sorted into top class in AH-model. Mostly, the importance of all criteria is not similar and AH-model is much reliable in this term.

However, the classification process of AH-model is not transparency and operates like a ‘Pandora's box’. For the big range of products, even the products’ value to criterion have been know and users are still not sure about importance level of products. Users may control classification process at very low level. Secondly, classification output with AH-model is the classes’ sets of a number of products. One product has direct link to specific class. Unfortunately user can’t get the information or description of products in specific class.

4.3. Decision

It is decided to select *Cross Tabulate Matrix* as classification model in Oriflame. Here are some reasons to their selection as following

In Oriflame, business process is required to keep transparency in order to control and trace effectively. Hence, it is easy to identify operation and management error in organization.

Business process must be easy to understand and simple to use, as a result, each employee without specialized skill can go through it. If training is required to go through business process, it would cause large cost to organization.

If one model can be applied widely in organization and benefit a lot of employees, it would be accepted widely and delivered easily.

Obviously, Cross Tabulate Matrix satisfies requirements more.

5. Implementation in Oriflame

5.1. Sample Calculation

The sample consists of all products with status: N, X, C and Z, as a result, there are about 2000 products in sample. In calculation, products are classified into ABCD-Classes according to their value with respect to 2 criteria: sale contribution and catalogue-elements. Three time horizons are selected, which are 3, 6 and 9 months. 3 months is in alignment with first 3 month sale target of super launch.

Since catalogue plans of products are generated for different regions, here product score of catalogue-element is calculated as the maximum scores of CIS and EMEA catalogue-element in sample calculation. In fact, CIS and EMEA account for the majority share.

Proportion of ABCD-Classes on top level or category level can be extracted from classification result shown in Table 5.1 and Figure 5.1.

Number of Codes in ABCD					
CLASS	**A**	**B**	**C**	**D**	**TOTAL**
3 M	167	416	430	952	1965
6 M	234	439	464	957	2094
9 M	262	447	457	928	2094

Table 5.1 Product Classification Results

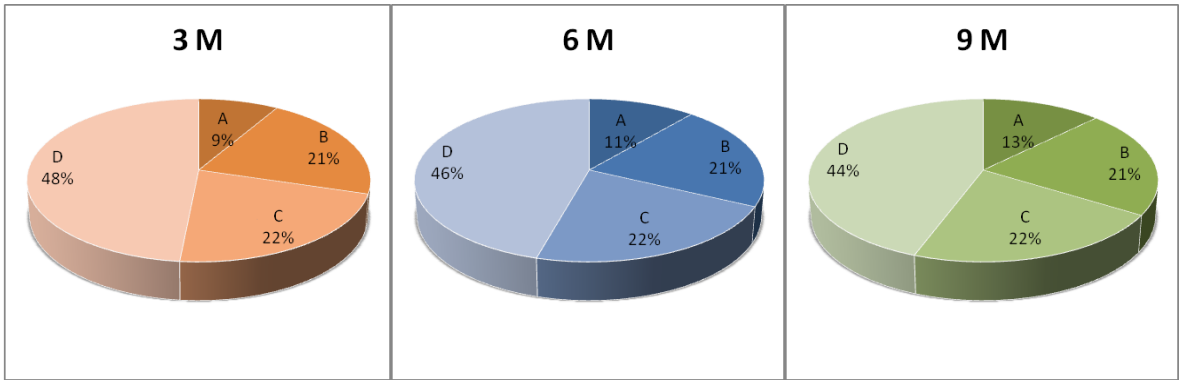


Figure 5.1 Product Classification Classes Share

It is shown in Figure 5.2, proportion of class A is increasing from 9 % to 13% with the time. At the same time, the Proportion of ABCD-Classes almost keeps consistent for

the periods of 3m, 6m and 9m. In sample calculation, it is important to identify products' moving among classes. Hence consistency test is used to identify frequency of products' moving.

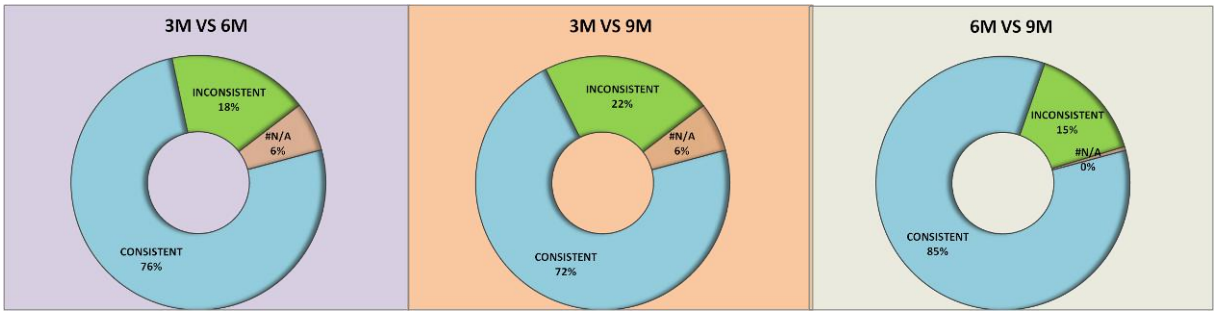


Figure 5.2 Product Classification Consistency Analyses

"# N/A" is resulted by new launch products. For the period of 3 month (May, June and July), products planned to launch after July are out of classification scope. Comparing classification result of 6 months and 9 months, about 85% products' class keep constant.

As mentioned in chapter of classification model, Super or non-super launch is treated as ancillary criterion to assess Super launches performance or whether all super launches are grouped in to class A. Hence classification analysis of super launches is done individually.

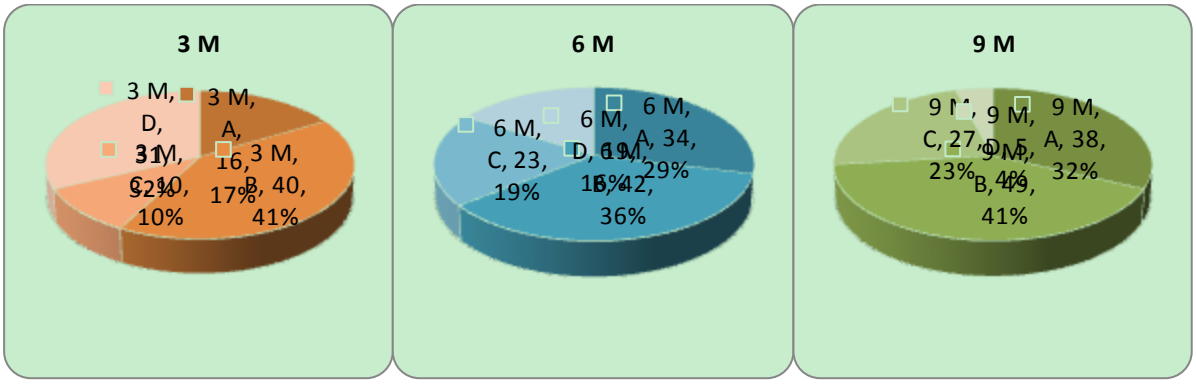


Figure 5.3 Super Launch Classes Share

In Figure 5.3, it can be seen that proportion of ABCD-classes for Super launches is changing dramatically not as similar as classification in whole. A number of super launches are new launch products with dynamic sale increasing. Classification consistency of super launch is shown in Figure 5.4.

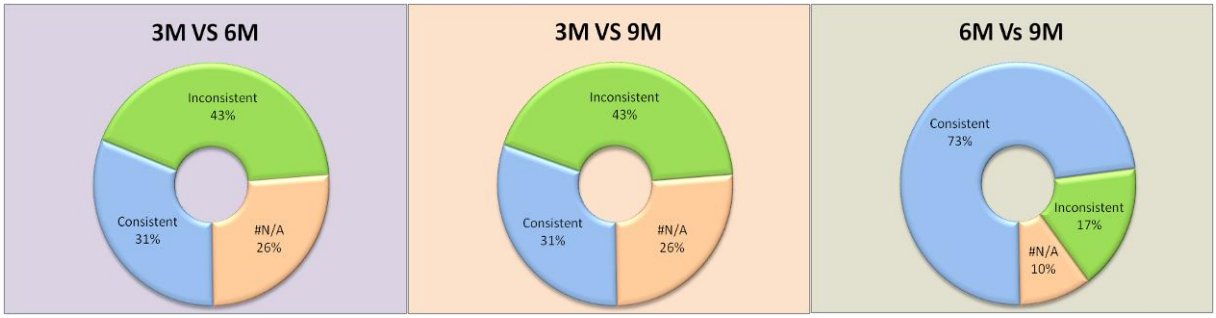


Figure 5.4 Super Launch Consistency Analyses

5.2. Time Horizons

5.2.1 Pros and Cons

	3 months	6 months	9 months
Scope	Small	Moderate	Large
Response time	Limited	Unlimited	Unlimited
Volatility	High	Moderate	Low
Other aspects	Effective to assess SL	Moderate	Acceptable Classification

Table 5.2 Analysis of Time Horizons' Features

Classification scope is changing with time horizon. The more products codes classification covers, the longer time horizon is. Because Oriflame updates products now and then and newness target is about 23%. At the same lime, classification with the large time horizon can also support long-term thinking to organization development and cooperation with suppliers.

On average, frozen production period is 2 months as Oriflame's suppliers agreed. Adjustment to supply plan is limited in short time horizon. For 3 months, it is allowed for suppliers to receive once order and reject rescheduling.

The volatility means codes moving among ABCD-classes with time. It is required to do Products Classification every week or month automatically. Obviously, Classification of short time horizon has higher volatility, vice visor.

In particular, classification of 3 months is much effective to assess Super-Launch products, which is aligned with business target- first 3 months' sale. Classification of 9 months is much comprehensive and acceptable with limited seasonally impact.

5.2.2 Utilization

After analysis of the sample calculation results, it is extracted both way of advantages and disadvantages within three time horizons. In this section, it is proposed to list the application areas of PCS in practical and give the specified procedures of application approach.

High Level Application

- Supply Planning Prioritization
- Information Transparency and Validation
- Workload Balancing
- Human Resource Management
- Super Launch Check

The Product Classification System (PCS) is designed for the sake of Global Supply Planning in Oriflame; hence the main application is prioritization of supply planning. Planners could firstly check the class tab of particular product code or product group according to the calculation results, and then decide the frequency of planning, consider the order quantity and other supply chain attributes as well. Direction of prioritization will be different with the chosen time period increasing.

Since the information is not so clarified in Oriflame ERP system, it is necessary to improve the transparency and validate the data source of ERP and linked data warehouse. From the sample calculation, it has been discovered that the Forecasting Top Level Report has some errors from data source points in the system. Therefore, the PCS is able to check the information consistency, improve the transparency and in particular validate the forecast data to some extent in order to aim more stakeholder departments.

From the very beginning of PCS design phase, the critical objective is decided to balance the heavy workload in planning process and reduce the non-value adding work. It is believed that the PCS could somehow balance the workload among categories, departments and even the individual planners and analysts. For instance, if there are more Class A products located in SKC than CCS category, it should be assign more workforces from CCS to SKC category.

Furthermore, the workload balancing will promote the human resource management and give suggestion to employee arrangement as well as recruitment planning.

As a single added criterion, Super Launch products should be checked after generation of classification results. In order to keep in consistency with super launch criteria defined by NPD department, it's necessary to check the Super Launch products and their accordingly class.

Application Areas in Different Time Horizons

Three Months

- Execution Prioritization
- Distribution Planning Top List
- Supply Planning Top List
- **Super Launch Check**

The Execution Prioritization could be illustrated from the timeline of supply plan which is shown below in Figure 5.5. Since the first 3-month period is in line with the execution of supply plan, the classification results could help the planner to check the performance of execution, and if there are some inconsistencies, they can communicate with the suppliers seeking for adjustment.

Figure 5.5 Supply Planning Timeline

It becomes easier for both Supply Planning and Distribution Planning to check the priority of products with high sale rate and featured more on the coming catalogue. Hence it is available to create the Top List of products, suppliers, production lines for Supply Planning and prioritize the transportation work from suppliers stock keeping points to Oriflame hubs for Distribution Planning.

In the 3-month period, Super Launch (SL) products involved in a smaller scope and launch in only four catalogues which will ease the check work of NPD and Marketing Department. In addition, the consistency level of SL criteria and SL sale performance could be an indicator for NPD to create plan of new SL design.

Six Months

- Make to Stock Planning Prioritization
- Supply Plan Confirmation
- Catalogue Strategy (Confirmation Process)

Since MTO products are placed only once order per year which is in line with six-month calculation, it is helpful for Supply Planning Prioritization. As the time goes on, supply plan proceed to confirmation phase with capacity and components status, it is therefore aid the checking of planning process.

As the shop window of Oriflame, catalogue is critical for the whole company's operation. On account of the chosen criteria is catalogue elements, weight have been set with bandwidth for different catalogue elements such as back cover and middle spread. Since the confirmation process is complicated, the classification results could backward give the guideline for catalogue planning to confirm and adjust their strategy.

Nine Months

- Supply Planning
- Purchasing/Planning Alignment
- Capacity Planning
- Awards: MOQ EOQ Batch and Pallet Size
- Safety Stock Management
- Vendor Check
- Identify Priority and Create Weekly Planning Strategy (VSM)
- Multi-sourcing Strategy
- Catalogue Check (long term)

The classification of nine-month period provide a long term thinking stage and display the large scope of products, sales condition, catalogue appearance and Super Launch performance as well. Thus it's more applicable for implementation and contributes the most to our stakeholders.

For Supply planning, it is primarily prioritize the work of Class A products. Planners could consider the planning frequency and communicate with critical strategic suppliers in order to formulate the supply plan.

To check the alignment of Purchasing and Planning, it is useful to take the classification results as reference, in that different classes' product have different components (SPIC) types and raw material source location. Purchasing process should respect to Supply planning to achieve the business goal on high level.

For capacity planning, it is suggested to judge the capacity for high priority products and balance the capacity by definition of MOQ, EOQ or pallet size in quantity. For example, it is possible for Supply Planning set the pallet size smaller for Class A than D since the order rate will be increased with the classes go up.

In the long term classification of nine-month period, it is believed that the classification results can provide feedback of catalogue performance and check the rationality of catalogue planning strategy. For instance, the Class A products should be more featured in platform of back cover, and Class D products could more appear in other section in the catalogue instead of platform or ending section.

For Inventory management, the ABCD classification results are highly significant to input into Project 2, creating the Safety Stock Strategy that help to set inventory level. For example, Class A products could have larger inventory level than other classes but it also depends on the current status of stock level.

Both internal and external suppliers are key check points for the smooth operation of Oriflame supply chain, it is suggested to dig into detail of long term (9 month) classification in order to check the vendor performance. It is known that an ongoing project of Vendor performance evaluation is running in Purchasing Department, hence it's useful for employee to check whether the vendor performed in line with the classification results, the share of different vendors and the cooperated importance of external suppliers. Adjustment measures should be taken to keep in consistency with all the vendors and achieve good supply chain flow.

As the classification results are generated from long term calculation, the performance of each product code is more transparent and robust for Supply planning to identify the specified planning strategy. For some super critical products, VSM could be done to analyze the current state of supply chain, locate the bottleneck and propose the solution to optimize supply chain operation. The frequency of planning for critical products could also be considered by the classification results.

For critical products, it is no doubt that good starting point of sourcing enable the fluent operation of supply chain. If the sourcing location is single selection for high priority products, Supply planning could research the extra sourcing location and make those products multi-sourced so that they can fulfill the market requirement.

For Catalogue Planning, the long term results could give overview of Oriflame product portfolio, so that catalogue planners are able to check the products performance and judge the catalogue strategy, for instance, if the sales drivers are more lie in Toiletry Category, they need to feature them more on back cover of ending section.

6. Conclusion

Since the project of product classification is in the scope of supply chain management in Oriflame, it impacts on supply chain's performance to some extent. Product classification is supposed to be applied in supplier management, supply planning and inventory management, etc.

Product classification would give solutions to balance capacity of production, supply and facility in order to optimize utilization of limited resource and minimize kinds of waste. Without product classification, it happens like that production capacity is occupied by "Trivial many" and "less valuable" products and limited capacity is left for "significant few" and "valuable" ones. In this case, resource of production capacity is not made use of effectively and meanwhile human resource is wasted on less valuable products. With product classification, "significant few" and "valuable" would be identified and draw most attention of management, which is helpful to meet organization business target and improve supply chain management.

Product classification benefits the standardization and smooth of supply chain flow. In every activity, "significant few" and "valuable" items can be easily identified and checked. Meanwhile stakeholders within supply chain could find correct direction to improve their performance. As a result, crucial problems like out of stock, excessive stock or unexpected interruption are minimized in some level.

In addition, some other problems are found during the project. There are some personal advices to improve Oriflame's business in the following paragraph.

Reduce the big scope of product codes. In Forecasting, top level report is generated every month. There are about 9000 product codes in all in top level reports excluding B or dead product codes, that is, 9000 products are being sold in Oriflame now. There is no doubt that cosmetic companies are supposed to update their products now and then in order to catch customer demands. However, when products of L, N, X and C become discontinued, their forecasting data would never been modified and checked again in fact. Meanwhile error hides in a too big range of product codes to discover. Whatever the error is would cause waste and costs widely.

Use diversified methods or approaches to forecast demand of products with different status separately. Products with different lifecycle have different performance in market, which would reflect on sale curve in specific period or certain

campaign. Specification on different sale curve of products with different lifecycle would improve forecasting accuracy.

Improve inventory transparency and balance inventory capacity among all warehouses. In Oriflame, inventory for one market couldn't be made use of by another market at the same level. It happens like that might inventory of specific product for one market is very high while it is out of stock for another market. As a result, the first market should afford high storage cost and at the same time the second market would keep high cost of out of stock. If inventory is shared by markets at the same level, cost of excessive inventory and out of stock would be controlled to some extent.

7. Appendix

7.1 Glossary

Term	Definition
ERP	Enterprise Resource Planning is an Integrated computer-based system used to manage internal and external resources including tangible assets, financial resources, materials, and human resources[25]
PCS	Product Classification System
SKC	Skin Care Category
CCS	Color Cosmetics Category
FRA	Fragrances Category
TOI	Toiletry or Personal & Hair Care
ACC	Accessories Category
Well	Wellness Category
OTH	Other Categories
CIS	The Commonwealth of Independent States is a regional organization whose participating countries are former Soviet Republics, formed during the breakup of the Soviet Union[26]
EMEA	Central Europe and Mediterranean & Western Europe and Africa
LA	Latin America Area
OPP	Oriflame Production Poland (Factory)
OPS	Oriflame Production Sweden (Factory)
OPR	Oriflame Production Russia (Factory)
OPI	Oriflame Production India (Factory)
OPC	Oriflame Production China (Factory)
KPI	Key performance indicator of business which is chosen to evaluate business processes and improvement
SPIC	Sales Production Inventory Capacity is a product classification method for different component types which linked to the Primary Packaging Part. The usage of SPIC is that they should categorise how the finished goods is being produced.
PIP	PIP provide the detailed information under the SPIC category
NPD	New Product Development Department
EOQ	Economic Order Quantity is the inventory level that minimizes the total inventory holding costs and ordering costs[27]

MOQ	Minimum order quantities (MOQ) are sometimes used where there a limitations to the production of an item or where its handling does not allow sales of very small or unitary numbers of items[28]
VSM	Value Stream Mapping is a lean manufacturing technique used to analyze the flow of materials and information currently required to bring a product or service to a consumer[29]

7.2 Product Lifecycle in relation with Production Mode

	N	L	D	X	Z	C
Definition	Ongoing product	Limited life product	Discontinued product	Pop-up (back from D as LL)	Zombie (back from D as N)	Corporate product
Lifecycle	3 years	6 to 12 months	No production in 6m, obsolete 18m	6 to 12 months	Depend on demand	Depend on promotion time plan
Production mode	MTS	MTO	MTO	MTS	MTS	MTS

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