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BANK SERVICES AND PRODUCT MARKETING CONTROLLING: APPLYING MULTIVARIATE METHOD FOR CUSTOMER SATISFACTION VARIANCE ANALYSIS

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Abstract: The authors in the study demonstrate how Product and Marketing Controlling can utilise the applied statistics from social sciences to understand the root cause of the gap between the planned and actual customer satisfaction (regarding to the branch and counter services) at one retail bank in the United Kingdom. In order to understand the underlying factors the authors conduct factor analysis on the data from the detailed survey by the bank that targeted the customer satisfaction. The three key factors that have been identified as key drivers of the customers' satisfaction with the overall service quality in branches are the satisfaction/quality of branch personnel; the satisfaction with the branch infrastructure; and the process quality. The key performance indicators build around these factors enable the analysts to understand the trends and the key driver of the variance of customer satisfaction plans (target vs. actual analysis). This study as part of a strategic bank planning and control ("Controlling") framework highlights the importance of cost effective solutions in the field of bank marketing. The scientific approaches such as factor analysis have an emerging importance in the practice of bank controlling.

Keywords: factor analysis, marketing-controlling, bank, service quality, customer satisfaction

1. INTRODUCTION

The impact of the bank sector on the modern economy and society is significant. There is a transformation in the system as a result of the recent financial crisis. The focus has shifted from the pure profit- and product-oriented thinking towards to the effective, sustainable and profitable management control, where besides the basic services the organisations are aiming to add value for the investors and the customers. In order to achieve this banks have to develop an effective planning and controlling system that is adapted to the new challenges and focusing on financials, customer and market at the same time rather than on financials only.

The required adaptation can be achieved through the Product and Marketing Planning and Control ("Marketing Controlling") sub-system that can:

- define marketing sales and financial targets (in collaboration with the Finance department) based on financial and market challenges;
- keep track of the actual margins, income (P&L), transfer prices, sales, market movements and customer metrics, etc.;
- analyse in details the gap between the plan and the actuals, to understand the root cause and to explore the possibilities for re-steering
- in order to provide the management with the up-to-date and relevant management information for the effective decision making.

The authors in the current study demonstrate how the Marketing Controlling can utilise the applied statistics from social sciences to understand the root cause of the gap between the planned and actual customer satisfaction (regarding to the branch and counter services) at one retail bank

in the United Kingdom. In order to understand the underlying factors and set the key performance indicators the authors use factor analyses on the data from a detailed survey by the bank that targeted the customer satisfaction. The survey was completed in February 2013 with over 2,300 participants in London, Milton Keynes, Leicester, Glasgow and Liverpool at multiple branches of the bank by randomly selected customers on the day of the survey.

The primary aim of this approach in the current study is to reduce the number variables and to identify the latent factor structures in order to simplify the outcome of the survey for the management.

The results of the current study can be beneficial for both the marketing and financial analysts as well as for academic researches as it helps them to understand the key drivers behind branch satisfaction. The study also demonstrates the emerging need for the scientific approaches and applied statistical methods in the marketing controlling and in the banking industry.

2. LITERATURE OVERVIEW

In order to build a deep relationship with the customers, increase the customer loyalty banks have to meet their customers' needs and increase their overall satisfaction. Kotler [6] defines customer satisfaction as *"a summary psychological state when the emotions surrounding disconfirmed expectations are coupled with the consumer's prior feelings about consumption experience"*. As the bank sector is a service industry and the "consumption experience" is primarily linked to the service given to the customers, it is essential for banks to define and maintain the level of service quality where service quality is defined as the extent to which a service meets customers' needs or expectations. [8]

Findings of a recent study indicate *"that service quality has significant impact on customer satisfaction and customer loyalty, and customer satisfaction has stronger influence on loyalty"*. [5]

Therefore when banks try to measure how satisfied the customers are with their services (using an external agency, internal CRM or Marketing Planning functions) it is also very important to understand the key variables and factors that customers are taking into consideration when scoring their satisfaction with the banks' services.

Normally banks target certain levels of satisfaction aiming to improve the actual level constantly but when there is a difference between the plan and the actual then a gap analysis is required. Unlike financial plan-fact analyses customer related matters required different approaches, methodologies from social sciences and applied statistics. Current study is focusing on the factor analysis within the multivariate methods to understand the key factors of the service quality related customer satisfaction.

Often the natural and social phenomena can only be described by a complex system of variables and factors. The multivariate methods aim to explore, analyse and describe the interrelationships between these variables with a systematic approach. [12]

Regarding to the multivariate methods it is important to mention Aristotle and Georges Cuvier (1789) who laid the foundations of the concept of correlation [10]. Later Francois Galton (1886) used the basic idea of correlation coefficient and regression in his extensive biological researches [1] but Pearson (1886) was the first to mathematically elaborate this concept which was later used by Charles Spearman (1904) who's name is linked to the first application of principal component and factor analysis. [9].

The basic logic of his theory was that any indicators/variables that measure the general intelligence can be traced back to two latent factors (general and unique factors). General factors can be measured by generally applicable tests but the "u" factor can only be measured by special indicators. Spearman's model of "General intelligence" can be considered as the first factor analysis.

The next milestone on the field of multivariate methods is Leon Thurstone's study: *The Vectors of Mind* (1935). He described in details the factor analysis and the multi factor models by analysing the different levels of the intelligence. Later Thurstone (1947) created the basics of the theory of

factor rotation for a simplified factor structure which was finally elaborated by Kaiser in 1953 (The theory of analytical rotation for factor solutions – “varimax”).

From the 1960's the factor analysis was applied by not just psychometrics but other sciences too such as economics, information technologies, etc. [12] and through the extensive work (e.g.: χ^2 hypothesis testing) and research of Lawley & Maxwell (1973) today we refer to the factor analysis as a statistical methodology.

In the last two decades the fast growing information technology helped to spread the application of factor analysis. The increased capability of analysing data bases with millions of data points enabled researchers from the academia and business analysts to identify latent factors, to explore the interdependencies between variables and to simplify masses of data. Based on the current trend it is safe to say that this statistical tool will most likely play an important role in the next decade too.

3. MATERIALS AND METHODS

The authors in the current study have processed and analysed the results of a survey that targeted the customer satisfaction with over 50 questions and 20 branch service quality specific questions. The questionnaire was created by the authors, marketing planning analysts and customer researchers of the bank in order to understand the underlying factors of customer satisfaction and to explain the difference between the targeted and actual Q4 2012 satisfaction scores.

The survey was completed by randomly selected customers at randomly pre-selected 50 branches of the bank across the UK in February 2013. The total number of analysed responses (observations) in the database was 2220 after the initial data cleaning. The analysis was done with the SAS Enterprise Guide 4.1 statistical software.

The authors aim to reduce the number of variables that targeted the branch service quality by creating a factor structure of two or three factors. The respondents were asked to mark each question on scale with values from 1 to 7 where 1 represents “not satisfied” and 7 represents “completely satisfied”. The following questions (Table 1) are examples from 20, branch service quality questions.

Table 1 - Examples from the questionnaire

Variable name	Question
	How satisfied were you with...
Q3A	... the tidiness of the branch?
Q3B	... the structure of the branch?
Q4A	... the helpfulness of the branch staff members?
Q5B	... the knowledge of the branch staff members?
Q7	... the speed of the processes?
Q8A	... the queue time?
Q14A	... the information you were given by the staff members?
Q15	... the information on the branch posters?

Source: Branch Satisfaction Survey

3.1 ASSESSMENT OF THE PREREQUISITES

Context: It is important to assess and understand the economy or social problem before the application of any multivariate method. Several decisions have to be made about the hypothesis, data, methodology, techniques and even about expected results and solutions. In the current study authors use the 20 questions of the branch satisfaction survey that targets, the physical appearance of the branch (structure, accessibility, etc.), the marketing materials, the attractiveness of the branch, the processes, the staff, the location, and even the queue time with the intention to find two or three latent factors that can summarise and identify the key components of service quality related branch satisfaction.

Statistical requirements: As part of the assessment of the prerequisites several statistical analyses have to be carried out to decide whether the factor analysis can be applied or not. We have to assess whether the interrelationships between the variables exist (Correlation matrix), then we have to understand the strength of these interrelationships (anti-image matrix and Bartlett-test) and finally we have to decide if the remnant variables are suitable for factor analysis (Kaiser-

Meyer-Olkin criterion) or not. [11] The Table 2 summarises the findings of these test. Based on the assessment of the prerequisites the 18 variables are suitable for factor analysis.

Table 2: Summary of statistical tests

Correlation matrix	Anti-image matrix	Bartlett test	KMO ¹ criterion
<ul style="list-style-type: none"> ✓ There is a strong correlation between different groups of the variables ✓ At the same time this strong relationship doesn't exist between all variables which suggests that there are more than one factors 	<ul style="list-style-type: none"> ✓ The MSA² values are greater than 0,5 (0,62-0,92) apart from 2 variables (<i>values: 0,29 and 0,31</i>) ✓ These variables are excluded from further processing 	<ul style="list-style-type: none"> ✓ The null hypothesis of the Bartlett-test³ was rejected as the significance level is less than 0,05. 	<ul style="list-style-type: none"> ✓ The overall MSA was 0.73 which is above the 0,7 acceptance level⁴ therefore the processed (18) variables are suitable for factor analysis

Source: Own analysis. ¹ Kaiser-Meyer-Olkin criterion, ²Measure of Sampling Adequacy, ³Null hypothesis of the Bartlett-test: there is no correlation between the original variables [3], ⁴[11]

3.2 DETERMINING THE NUMBER OF FACTORS

There are several methodologies to define the number of factors extracted (Kaiser-Guttman rule, Scree-test, Common Method Variance). In the current study the ultimate aim of the factor analysis is to define the least number of factors that can satisfactory (*In principal component analysis the satisfactory level common variance explained by the components is at least 80%*. [12] *This can be different in different discipline and also depends on the methodology, for example in the natural sciences the level is 95% but in social sciences 60% can be satisfactory too.* [11]) explain the variance therefore any of the above mentioned methodologies can be applied.

This stage of the factor analysis has two steps: The first step is the initial factor extraction. For this authors applied the Principal factor method (computed by using the "proc factor" code in SAS) which means the number of factors is the same as the number of variables (18). The second step is the selection of factors with the combination of three methods (Scree test, Common Method Variance and interpretability)

As the Scree plot shows (Figure 1) there are two major drops of the eigenvalue. The first is after the first factor, the second is after the second factor. There are no further significant drops. The plot suggests that the first two or three factors can give the required factor structure. Authors decided to use the third factor as it is suggested by the further analysis that this factor gives additional value to the results.

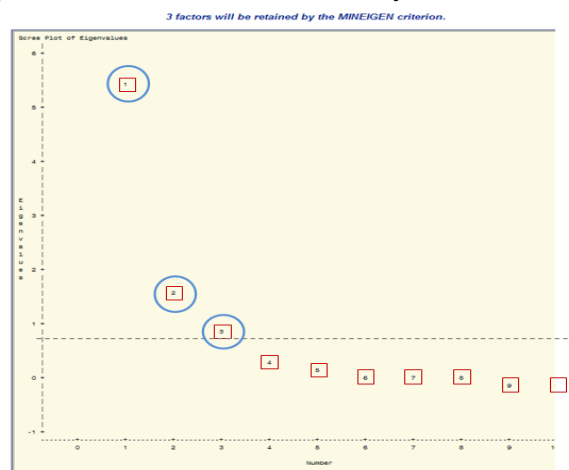


Figure 1: Scree plot (top 10 factors), Source: Own analysis

The decision was made based on the average communality of the variables prior to factor analysis which was 0,711 and the eigenvalue of the third factor (0,866) was greater than this value (Figure 2) and also based on the Variance explained criteria (total variance explained is 93.1%):

- ✓ The first factor explained 62.6% of the total variance with a eigenvalue of 5.407
- ✓ The second factor explained 19.8% of the total variance with a eigenvalue of 1.741
- ✓ The third factor explained the 10.7% of the total variance with a eigenvalue of 0.866

	Eigenvalue	Difference	Proportion	Cumulative
1	5.40652407	3.79691874	0.6262	0.6262
2	1.60960533	0.74316914	0.1983	0.8645
3	0.86643618	0.56013736	0.1068	0.9713
4	0.30629882	0.15042607	0.0377	1.0090
5	0.15587275	0.09146047	0.0192	1.0282

Figure 2: Eigenvalues of the Reduced Correlation Matrix (top 5 factors) Source: Own analysis

3.4 ROTATION TO A FINAL SOLUTION

Using the unrotated factor loadings is often leading to misinterpretation of the data and does not help the analyst to reveal the real relationships. As authors are looking to reduce the number of variables they choose the orthogonal (varimax) factor rotation method. This methodology helps to define the factors as this method is looking for the factor pairs with either strong or really weak correlation. The selection of variables based on their loadings on each factors is not always straightforward. As Sajtos-Mitev [11] says the least factor loading of a variable has to have is $|0.30|$ in order to be considered at all as possible variable of the factor. At the same time Hatcher [2] defines this limit at $|0.40|$. In the current study strong authors defines significant relationship at $|0.50|$ and strong is above $|0.70|$.

The FACTOR Procedure Rotation Method: Varimax				Rotated Factor Pattern					
				Factor1		Factor2		Factor3	
Orthogonal Transformation Matrix				Q3A	33		90 *		13
				Q3B	31		80 *		9
				Q3C	32		80 *		7
				Q4	74 *		37		16
				Q5A	89 *		28		12
				Q5B	78 *		28		5
				Q6	73 *		22		26
	1	2	3						
1	0.72190	0.58659	0.36713						
2	-0.11567	-0.42078	0.89976						
3	-0.68227	0.69200	0.23591						

Figure 3: The results of the rotation, Source: Orthogonal Transformation matrix and the factor loadings of the first 6 variables, SAS ; Source: Own analysis

There are 10 variables loading on the first factor, 5 on the second and 3 on the third factor. There are no variables loading on multiple factors (Figure 3). The final step is the check if the results are interpretable and to name the factors.

4. RESULTS

Based on the data from the survey and the factor analysis the following factors were defined:

- ✓ The first factor is called "Staff members" (Quality of personnel). This factor explained 62.6% of the total variance and represents the variables related to helpfulness, knowledge and speed of the staff members and also the information provided by leaflets and posters in the branch.
- ✓ The second factor is the "Branch structure" (Quality of infrastructure). This factor explained 19.8% of the total variance and represents the variables related to the physical structure of the branch, number of counters, location of ATMs and number of staff members in the branch.
- ✓ The third factor is called "Processes" (Quality of processes). This factor explained 10.7% of the total variance and represents the following variables related to the queue time, speed and simplicity of administration.

As the key factors are identified the bank can start to measure these elements and understand the difference in their trends. It allows the Marketing Planning Analysts to highlight the key source of the variance between the planned and the actual customer satisfaction score.

5. CONCLUSION AND DISCUSSION

The authors in the current study have processed and analysed the results of a survey that targeted the customer satisfaction with over 50 questions and 20 branch service quality specific questions. The questionnaire was created by the authors, marketing planning analysts and customer researchers of the bank in order to understand the underlying factors of customer satisfaction in order to explain the difference between the targeted and actual scores.

Three key factors have been identified as key drivers of the customers' satisfaction with the overall service quality in branches: Staff members (quality of personnel), branch structure (quality of the infrastructure) and the Process quality.

The next step for the marketing planning analysts is to conduct the same research for second time in order to understand the stability of the factors. If the factors are stable then performance indicators are required to be set and measured alongside regular customer satisfaction surveys.

This enables the analysts to understand the trends and the key driver of the variance in the customer satisfaction plan.

The result of this study has a practical and a theoretical benefit. On one hand this information can be used by customer behaviour, customer insight analysts as well as by marketing managers as a benchmark. On the other hand this information highlights the need for advanced statistical concepts and the importance of social and economic sciences not just in the banking industry but in all consumer centric (primarily service) industries.

This study as part of a strategic bank planning and control ("Controlling") framework highlights the importance of cost effective solutions in the field of bank marketing. The scientific approaches such as factor analysis have an emerging importance in the practice of bank controlling.

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