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CRM FACTORS ASSESSMENT USING ANALYTIC HIERARCHY PROCESS

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Abstract

Customer relationship management (CRM) has become a key strategic tool for many companies, especially in the current competitive environment. Customer relationship management is a relatively young and new approach not only in the world but mainly in the Czech Republic. It provides appropriate support for the management and efficient product and service offer to existing corporate customers. The goal of CRM is to build and active management of customer relationship. If a company decides to implement CRM systems, it is expected that this system will bring benefits. These benefits should lead to maintain or increase current turnover and profit. These factors are not among the objectives of the implementation of CRM systems, but the benefits resulting from its successful use. CRM brings measurable benefits and effects that can be observed only after a certain time, but also benefits manifested immediately after the implementation of CRM systems (Finnegan, Willcocks, 2011; Goldenberg, 2008). After the company implement specific CRM system is a matter of most of them, how to measure and evaluate the level of the implemented system.

The aim of this paper is to analyze the degree of factors' influence that affect the performance measurement of CRM systems using AHP method. Within the hierarchical structure of decision-making factors of CRM systems implementation are evaluated in six key areas: quality of customer information, support of CRM systems, effects of the CRM system implementation, customer satisfaction, profitability and processes. There has been setting up the evaluation matrix, which served as a basis for personal interviews, based on the identification of key areas and factors. Expert sample consisted of 5 selected managers of B2B companies in the Czech Republic. The purpose of these interviews was to determine the weights of individual criteria and sub-criteria using Saaty's method of pairwise comparison. The preliminary results suggest that the most influential factor is increase in sales to existing customers on the other hand investment support by the company management to further expansion of CRM does not play significant role in CRM systems evaluation.

Keywords: MADM methods, Analytic hierarchy process (AHP), Criteria, CRM, Factors evaluation

1. INTRODUCTION

CRM is an interactive process, which aims at achieving an optimal balance between corporate investment and satisfaction of customer needs. Optimum balance is determined by the maximum profit of both sides (see Chlebovsky, 2005; Storbacka and Lehtinen, 2002; Dohnal, 2002). A prerequisite to achieve this optimum is to create long-term relationships with customers. Long-term prospective cooperation brings both parties significant money's value.

CRM is a system that tracks customer interactions with the company and allow employees to find information about the customer, such as past orders, service history, problem solving, etc. All records are kept and used with the only aim to make the customer happy, because it is the customer through which trade runs (see Nguyen, Sherif and Newby, 2007).

According to Wessling (2003) Customer Relationship Management is a proactive approach and maintaining long-term beneficial relationships with customers. Communication with customers is ensured by appropriate technologies, which represent for the shareholders and employees of the company separate processes with added value. The three main elements are the people (human capital, customers), processes (focus, blending) and technology (type, scope, and consistency of the application area). The meaning and

purpose of these four elements is a comprehensive view of CRM. In order to implement CRM into existing organizational structures need to be addressed qualifications of personnel, technological equipment, focusing business processes and data management.

However, no single definition has been accepted in the literature. Zablah, Bellenger and Johnston (2004) mention in their paper the existence of more than 45 different definitions of CRM, which appear in the literature or derived from an internal terminology leading independent software vendors. The researcher has investigated different CRM definitions and concluded that the term CRM is generally understood corporate philosophy, or strategy, which focuses on reducing costs and increasing profitability of the company by building long-term relationships with its customers. It is a summary of information processes and technologies (Rogers, 2005), which provides benefits in the form of loyal customers (Kumar and Shah, 2004), better use of cross-selling activities, and help to build goodwill.

Performance measurement is used to evaluate the overall results of the past and identify the future position of the company in the top level management, in the individual level, performance measurement provides information about the shortcomings and motivate for the upcoming activities (Meyer, 2009). Current performance evaluation in CRM literature can be analyzed in four groups: (i) indirect measures and operational indicators, (ii) self-assessment, (iii) benchmarking with best practices, (iv) CRM Scorecards.

There are several methods how the CRM performance can be measured. The choice of one of the methods depends mostly on the experience of the company. These methods are for example Balanced Scorecard (Kaplan and Norton, 1992) or CRM Scorecard (Kim and Kim, 2009), CRACK model (Chlebovsky, 2005), cost-oriented approach (Moedritscher and Mussnig, 2005), CRM Maturity model (Sohrabi, Haghighi and Khanlari, 2010) or quantification of monitored factors without using any concrete model.

The purpose of this study is to compare the CRM performances of B2B companies using a multi-criteria decision making method. AHP is a multi-criteria decision making method (MCDM) that uses pairwise comparison of the factors or groups of factors (Ishizaka and Labib, 2011). AHP was applied in CRM performance measurement for example by authors Kim and Kim (2009).

2. ANALYTIC HIERARCHY PROCESS METHODOLOGY AND MODEL SPECIFICATION

The process of implementing CRM systems into the company structure is comparatively explored and known on the market. There are many studies and scientific publications describing this issue. After the companies implement specific CRM system is the issue of most of them, how to measure and evaluate the level of the implemented system. Absolute generalization in this area is not possible. The measurement cannot create in absolute form, which will be useful in every company. There must be a certain adaptation of the structure and the environment in which the company is located.

Performance is defined as the potential for future success of actions in order to reach the objectives and targets (Lebas, 1995). In this study, the performance evaluation model is proposed in accordance with literature review and interviews with experts and the performance of CRM is analyzed in six related categories (criteria), the relationships between the criteria are identified and the sub-criteria under each criteria are defined. The criteria utilized in CRM performance evaluation can be listed as: (i) quality of customer information, (ii) support of CRM systems, (iii) effects of the CRM system implementation, (iv) customer satisfaction, (v) profitability and (vi) processes (see Fig. 1).

The task is to select those groups of factors, which directly contributes to the success of CRM systems. It is the task of multi-criteria selection, solution of these tasks are handled by different methods for decision-making, one of these chosen methods is the method AHP (Analytic hierarchy process).

Analytic hierarchy process (AHP) has been described in several publications Thomas L. Saaty, a professor at the University of Pennsylvania in Pittsburgh, USA, in the 80s and 90s. This method is now widely used in the decision-making. For many years, especially in the social sciences uses Saaty method of paired comparisons, which forms the backbone of a consistent methodology multi-criteria decision called analytic hierarchy process. AHP is inherently general theory of measurements, these measurements to quantify the value of the subjective views of individuals or groups. Analytic hierarchy process (AHP) is one of the appropriate means of multi-criterial decision or assessment. The role of multi criteria evaluation of alternatives is mainly finding the best variant and configuration variants from best to worst see Saaty, Vargas (2012).
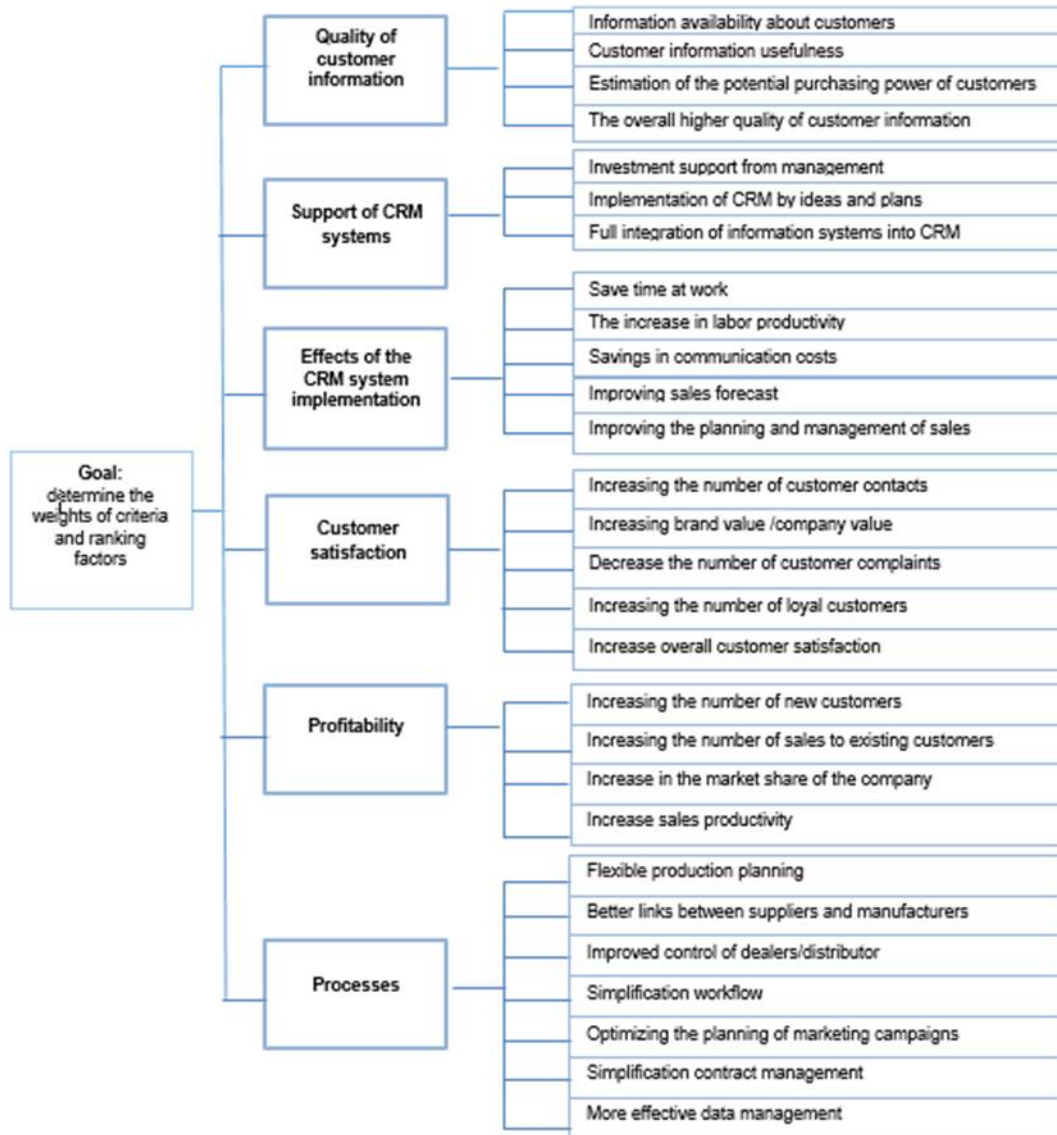
Figure 1. The AHP model

Source: self-elaboration

AHP method is based on the innate human ability to use information and experience to estimate the relative importance through pairwise comparisons. These comparisons are used to construct ratio scales in different dimensions, both tangible and intangible. The arrangement of dimensions in a hierarchical or network structure allows a systematic approach to the organization of the basic considerations and intuition for help divides the problem into smaller parts. AHP leads from simple pairwise comparisons to the priorities in the hierarchy see Saaty, Vargas (2012).

The theoretical procedure of the AHP method consists of four steps: (i) hierarchy design (goal definition, identification of alternatives, identification of evaluation factors, assignment of criteria and factor relationships and finishing of the hierarchy), (ii) identification of priorities (application of pair-wise comparison, point evaluation of significance, repeating of the procedure for all hierarchy levels), (iii) combination and (iv) evaluation (weighted values of alternative solutions) and comparing alternatives (calculate final values for each variant and their comparison) see Saaty, Vargas (2012).

The Saaty's method of pair-wise comparison has to be applied on each level of the hierarchy structure. The first level of the hierarchy is the goal of the evaluation (determine the weights of criteria and ranking factors). The second level of the hierarchy represents evaluation criteria (the goal of the evaluation depends

on which evaluation criteria will be used). The third level of the hierarchy is made of evaluation sub-criteria. Prioritization (evaluation) is based on an expert estimate at which compares the influences of factors. Rating scale has nine stages, which are listed in Tab. 1.

Table 1. Saaty's comparison fundamental scale

Degree	Descriptor
1	Criteria *i* and *j* are equal
3	Low preference of criteria *i* before *j*
5	Strong preference of criteria *i* before *j*
7	Very strong preference of criteria *i* before *j*
9	Absolute preference of criteria *i* before *j*
2, 4, 6, 8	Medium values for more precise preference determination.

Source: Saaty (1994)

The rank of alternatives and selection of the optimal one is based on weighted sum criteria (total weighted utility) of the alternative. Then for the weighted sum criteria of normalized weights following formula can be applied:

$$U(a_i) = \sum_{j=1}^{m} w_j x_{ij} , \qquad (1)$$

where x_{ij} represents the evaluation of the ith alternative according to the jth criterion. The w_j represents the normalized weight of the jth criteria. The weights w_j can be obtained through an algorithm based on the geometric mean method (method of least logarithmic squares) under the same necessary condition then the solution is a normalized geometrical mean of the matrix as follows

$$w_j = \frac{\left[\prod_{j=1}^{m} s_{ij} \right]^{\frac{1}{m}}}{\sum_{j=1}^{m} \left[\prod_{j=1}^{m} s_{ij} \right]^{\frac{1}{m}}} , \qquad (2)$$

for i=1,…,m. The geometrical mean can be calculated using MS Excel function GEOMEAN. This function will be employed for calculations in the application part. In the AHP method, decision makers or experts who make judgments or preferences must go through the consistency test. In order to determine that if the judgment of the respondents satisfies the consistency, which are conducted based on the consistency ratio (CR) of the comparison matrixes. CR is calculated using following formulas

$$CR = \frac{CI}{RI} = \frac{\frac{\lambda_{max} - n}{n-1}}{RI} , \qquad (3)$$

where *RI* is a random index see Table 2. When *CR* ≤ 0.1, it can be regarded as the valuation process satisfies the consistency. To calculate *CR* it is necessary to calculate the consistency index *CI* first. If *CI* = 0, satisfies the consistency. If *CI* > 0, means the experts have conflicting judgments. If *CI* ≤ 0.1, a reasonable level of consistency. λ_{max} is maximum eigenvalue and can be calculated as follows:

$$\lambda_{max} = \frac{\frac{1}{n} \sum_{i}^{n} (S \cdot w)_i}{w_i} , \qquad (4)$$

where *w* is a vector and $(S.w)_i$ is an *i*-element of the vector.

Table 2. Random index

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Source: Saaty (1977)

The resulting local and global scales evaluated criteria were calculated in MS Excel. There has been

setting up the evaluation matrix, which served as a basis for personal interviews, based on the identification of key criteria and sub-criteria. So the evaluation of the criteria and sub-criteria has been done by a panel of experts. Expert sample consisted of 5 selected managers of B2B companies in the Czech Republic. The purpose of these interviews was to determine the weights of individual criteria and sub-criteria using Saaty's method of pairwise comparison. Aggregation was performed at the response experts' level and then weights have been calculated using Row Geometric Mean Method to determine local and global priorities.

3. RESULTS AND DISCUSSION

In order to use the analytical hierarchical process was compiled evaluation form contains six criteria. Within each criterion was defined more sub-criteria, the number against each criterion was different in each group (see Fig. 1). The result is an evaluation system of components with the highest priority. All the experts evaluated the criteria and sub-criteria and determine the size of each preference according to Saaty nine-point scale. To obtain quality and relevant results it was necessary to respect the requirement of consistency Saaty matrices according consistency ratio (CR). It was found that all Saaty matrices are consistent. Values of the consistency ratio were lower than 0.1 in all cases of comparing.

Table 3. Results of AHP

Criteria	Sub-criteria	Local weights	Global weights
Quality of customer information (0,103)	Information availability about customers	0,138	0,0142
	Customer information usefulness	0,146	0,0149
	Estimation of the potential purchasing power of customers	0,219	0,0224
	The overall higher quality of customer information	**0,497**	**0,0510**
Support of CRM systems (0,037)	Investment support from management	0,153	0,0057
	Implementation of CRM by ideas and plans	0,362	0,0134
	Full integration of information systems into CRM	0,484	0,0179
Effects of the CRM system implementation (0,111)	Save time at work	0,059	0,0065
	The increase in labor productivity	0,132	0,0146
	Savings in communication costs	0,254	0,0281
	Improving sales forecast	0,254	0,0281
	Improving the planning and management of sales	0,302	0,0334
Customer satisfaction (0,258)	Increasing the number of customer contacts	0,040	0,0104
	Increasing brand value /company value	**0,171**	**0,0442**
	Decrease the number of customer complaints	0,152	0,0393
	Increasing the number of loyal customers	0,286	0,0738
	Increase overall customer satisfaction	**0,351**	**0,0906**
Profitability (0,362)	**Increasing the number of new customers**	**0,131**	**0,0476**
	Increasing the number of sales to existing customers	**0,479**	**0,1735**
	Increase in the market share of the company	**0,243**	**0,0880**
	Increase sales productivity	**0,147**	**0,0533**
Processes (0,129)	Flexible production planning	0,200	0,0258
	Better links between suppliers and manufacturers	0,206	0,0265
	Improved control of dealers/distributor	0,213	0,0274
	Simplification workflow	0,154	0,0198
	Optimizing the planning of marketing campaigns	0,124	0,0159
	Simplification contract management	0,048	0,0062
	More effective data management	0,057	0,0073

Source: self-elaboration

The results presented in the Tab. 3 show allocation of priorities among criteria and sub-criteria. The greatest weight experts attribute the criterion of profitability and customer satisfaction. This result is not surprising, since the profit is usually the main objective of business operations and implementation of CRM

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systems can be increased. Customer satisfaction leads to loyalty and a greater likelihood of an increase in sales and cross-selling opportunities. The minimum weight of only 3.70% is assigned to support of the CRM system implementation.

All coefficients of global weights are provided in Tab. 3 in the last column. Hundred percent was divided among all factors considering the importance coefficient of the group of factors. For CRM performance measurement are the most important factors:

i. Increasing the number of sales to existing customers (17.35%)
ii. Increase overall customer satisfaction (9.06%)
iii. Increase in the market share of the company (8.80%)
iv. Increase sales productivity (5.33%)
v. The overall higher quality of customer information (5.10%)
vi. Increasing the number of new customers (4.76%)
vii. Increasing brand value /company value (4.42%)

An important finding is that an increase in the number of sales to existing customers is more important than acquiring new customers. It is generally known that retain customer is less expensive than getting a new customer. Through Saaty method, this view was supported. Much more important is that existing customers to increase the amount of their purchases within a company.

If increasing overall customer satisfaction, we can assume that also a growing number of loyal customers who will return regularly and buy the products of the company. Satisfied customers are also much less likely to switch to competitors and can save the company, for example, in times of economic crisis. It is logical that the highest importance was determined precisely by these factors. Increasing the number of customer contacts is not the aim of CRM systems, it is mainly an effort to streamline this relationship. It is not important to contact the customer often, but effectively with offerings to better meet their needs and preferences. Importance of 1.04% in this case is very low, but it corresponds to the requirements of companies in relation to CRM systems.

Factors such as investment support from management (0.57%), simplification contract management (0.62%), save time at work (0.65%) and more effective data management (0.73%) are less important for CRM performance measurement. If the chosen CRM system best meets the requirements of companies, it is logical that its further expansion is not so crucial for businesses. There are not obvious expectations to simplify the contract management of and more efficient data management. The results clearly show that is not crucial for managers, whether the implementation of CRM systems contribute to saving time at work, far more important factor is the improvement in sales.

CONCLUSION

The aim of the paper was to define rank of factors measuring CRM performance. This research was based on application of the AHP method for the performance measurement of CRM systems in the B2B market. This approach helped to scale down the number of measures and helped to determine the most important criteria which lead to the achievement of firm's strategic goals. The importance weights were determined via experts. The coefficients for each group of factors and for each factor (local and global weights) were calculated. The obtained results clearly show that the best important factors are increasing the number of sales to existing customers (17.35%), increase overall customer satisfaction (9.06%), increase in the market share of the company (8.80%), increase sales productivity (5.33%), the overall higher quality of customer information (5.10%), increasing the number of new customers (4.76%), increasing brand value /company value (4.42%).

The expert group considered least important in the context of CRM systems support investments made by the company's management to further expansion of CRM, simplify management contracts. Neither saving time at work by implementing CRM systems and more efficient data management experts do not consider to be very important, since the value of importance in both cases is less than 1%.

Further research is planned to investigate other combinations of multiple attribute decision-making methods and especially multilevel decomposition methods of AHP and ANP with marketing models together with theoretical and practical applications.

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REFERENCE LIST

Chlebovsky, V. (2005). *CRM řízení vztahů se zákazníky*. Brno, Czech Republic: Computer Press.

Dohnal, J. (2002). *Řízení vztahů se zákazníky: procesy, pracovníci, technologie*. Praha, Czech Republic: Grada.

Finnegan, D. and Willcocks, L. P. (2011). *Implementing CRM: From Technology to Knowledge*. New Jersey: John Wiley & Sons.

Goldenberg, B. J. (2008). *CRM in Real Time: Empowering Customer Relationships*. USA: Cyberage Books.

Ishizaka, A. and Labib, A. (2011). Review of the main developments in the analytic hierarchy process. *Expert Systems with Applications*, 38(11).

Kaplan, R. S. and Norton, D. (1992). The balanced scorecard - Measures that drive performance. *Harvard Business Review*, 70 (1).

Kim, H. S and Kim, Y. G. (2009). A CRM Performance Measurement Framework: Its Development Proces and Application. *Industrial Marketing Management*, 38 (4).

Kumar, V. and Shah, D. (2004). Building and Sustaining Profitable Customer Loyalty for the 21st Century. *Journal of Retailing*, 80 (4).

Lebas, M. J. (1995). Performance measurement and performance management. *International Journal of Production Economics*, 41 (1).

Meyer, M. V. (2009). *Rethinking Performance Measurement*. Cambridge: Cambridge University Press.

Moedritscher, G. and Mussnig, W. (2005). Evaluating the long-term benefit of CRM-Systems: A cost-oriented approach. *International Journal of Innovation and Technology Management*, 2(4).

Nguyen, T. H., Sherif, J. S. and Newby, M. (2007). Strategies for Successful CRM Implementation. *Information Management & Computer Security*, 15 (2).

Saaty, T. L. (1977). A scaling method for priorities in hierarchical structures. *Journal of Mathematical Psychology*, 15 (3).

Saaty, T. L. (1994). *The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation*. New York: McGraw Hill.

Saaty, T. L. and Vargas, L. G. (2012). *Models, Methods, Concepts & Applications of the Analytic Hierarchy Process*. New York: Springer.

Sohrabi, B., Haghighi, M. and Khanlari, A. (2010). Customer relationship management maturity model (CRM3): A model for stepwise implementation. *International Journal of Human Sciences*, 7 (1).

Storbacka, K. and Lehtinen, J. (2002). *Customer relationship management*. Praha, Czech Republic: Grada.

Wessling, H. (2003). *Aktivní vztah k zákazníkům pomocí CRM*. Praha, Czech Republic: Grada.

Zablah, A. R., Bellenger, D. N. and Johnston, W. J. (2004). An Evaluation of Divergent Perspectives on Customer Relationship Management: Towards a Common Understanding of an Emerging Phenomenon. *Industrial Marketing Management*, 33 (6).