

Metrics of Collaborative Banking Systems

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Abstract: *This paper describes types of collaborative systems, classified by field of application. The collaborative banking systems are analyzed in order to create the specific indicators that build the metrics of these systems. There are presented procedures for metrics building and validation, in order to confirm that the metrics built are correct. An experimental and comparative analysis is made with the real data extracted from the database of Collaborative Multicash Servicedesk application.*

Keywords: *collaborative systems, banking, metrics, validation, comparative analysis.*

1. Types of collaborative systems

The collaborative systems are an important research subject of the knowledge-based society and are widely used today in various activity fields, such as banking, medicine, education and military activities. Their complexity is very high and the development involves numerous resources and costs.

Types of collaborative systems counts:

- *collaborative systems in education*, which active in the educational and research field and pursue increased performance and testing of the educational process;
- *collaborative systems of defense*, active in military field and are defined by strict rules of organizing and functioning;
- *collaborative systems in production*, pursuing increased production capabilities and product quality within distinct goods and services production units;
- *collaborative banking systems*, used by banks and financial units, these systems are analyzed along this paper in order to determine the parameters that influence the banking systems and all its components;
- *electronic business systems*, companies' departments are becoming more and more integrated, and clients are now users of e-business systems, thus replacing the traditional security mechanisms with authorization software – the modern security systems which manage and store users' data and correlate them with the access rules of the organization;
- *public administration systems*, used for managing tax collection, for integrated management of human resources and payroll, for querying city hall databases on citizen demand;
- *media software development systems*, media applications development was indirectly caused by the increasing of common use electronic devices; these systems include commutations stations for wireless, terrestrial, satellite and cable infrastructure.
- *collaborative functional systems*, include the *collaborative banking systems* and cross all the activities taking place in the economy, providing necessary information and overall coordination for production and finance management;
- *collaborative micropayment systems*, allows customers and content providers to use their payment system of choice [1];

- *collaborative planning systems*, present the most appropriate way to tackle certain kind of planning problems, especially those where a centralized solving is unfeasible [2];
- *collaborative tagging systems*, which provide a new means of organizing and sharing resources [3] [4];
- *collaborative writing systems*, their major benefits include reducing task completion time, reducing errors, getting different viewpoints and skills, and obtaining an accurate text [5];
- *collaborative medical systems*, in which modern communication technologies allow doctors from around the world to work on the same patient [6].

The collaborative systems are classified in many categories and there are a lot of criteria for collaborative systems classification.

2. Collaborative banking systems

The collaborative banking system is a system with high complexity, with a large number of components and a large variety of links between them. The complexity of the banking system is given by the operations they carry out, but also by the collaboration between different banks from different countries and by the alignment to standards imposed by the regulations in this worldwide field.

Bank's financial results depend largely on the quality of staff and the efforts of each employee separately. For each position of the bank, the department of human resources is seeking people with a degree of training higher than required by the job in question. The goal of this recruitment is the elimination of cases in which an employee fails to meet certain requirements or to resolve certain issues related to its activity. Training of employees at work must be done at least every five years. During this period, an employee of the bank carries out one or more trainings.

In a bank which offer helpdesk services for the Multicash application was implemented an application, in order to determine the categories of incidents with the great number of requests. This application is called Collaborative Multicash Servicedesk and is available at <http://collaborative.ase.ro/teza>. The Collaborative Multicash Servicedesk application involves three categories of users: customer, bank analyst and administrator. Each user has a different interface depending on its category. The customers have the possibility to post a problem, to view an existing solution from the knowledge database and to view the status of their posted problems. The bank analyst can take a problem posted by a customer and solve it. The administrator has the possibility to generate reports regarding the status of problems solved by each bank analyst.

The banking system is collaborative by its organization and definition. In a bank the collaboration it is at all structural levels. From organizational point of view, there is collaboration between departments, but also between central bank and its branches.

From informatics point of view, software applications collaborate and are integrated into an information system. An electronic payment application works together with the application for transactions processing and settlement and with the application for rejections monitoring. If any of these three applications is not working, then the customers fail to make payments. Collaboration at the level of a bank's information system is more efficient by integrating several applications of the system.

3. Metrics building and validation

A metric of collaborative systems is a mathematical model developed around an equation. Metrics use analytical expressions having the form: $y = f(x, z, w)$, where x , z and w are variables of influence factors, and y is the result variable.

The technology for building metrics of collaborative systems has the entry point that collaborative systems are influenced by the factors f_1, f_2, \dots, f_n , which have associated a series of variables. It is realized a graph of influences and is made a factorial analysis, in order to analyze the variables. There is built a correlation between these influence factors. Result a lot of dependent variables and a lot of independent variables. There are built analytical expressions. It is specified the performance criterion and result a technology that allow building the optimal metric in relation to a lot of influence factors and a performance criterion.

The metrics must be not too complicated because it will use lots of resources when implemented and also it must be not too simple because the measured levels will loose relevance.

A metric of collaborative systems must be characterized by the following properties: sensitivity, not compensatory character, not catastrophic character, representativeness.

The metrics helps to make a quantitative analysis of the collaborative banking systems. In order to evaluate the collaborative banking systems, were defined several metrics, like the followings:

- the maximum number of training sessions, TS , which the bank will finance over a period of five years, is calculated according to the relationship:

$$TS = 5 * NP,$$

where:

NP – the numbers of people employed in the bank and which are eligible for training.

- the degree of increasing the level of staff training, GP , is determined according to the relationship:

$$GP = \frac{NC}{NT},$$

where:

NC – the number of persons qualified in the five years;

NT – the total number of training or qualifications supported by the bank.

- the assessment indicator of a bank officer, BO , is calculated according to the relationship:

$$BO = ANP * p_1 / (AST * p_2 + AHT * p_3) * AAM * p_4,$$

where:

AST – the average serving time;

AHT – the average holding time;

ANP – the average number of people waiting in line;

AAM – the average amount of money traded by a person per unit time;

p_1, p_2, p_3, p_4 – weights with $p_1 + p_2 + p_3 + p_4 = 1$.

For a bank in Romania were obtained the following experimental values of the indicators *AST*, *AHT*, *ANP* and *AAM* for a number of 10 served clients:

Table 1. The values of waiting in line indicators for a collaborative banking system

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10
The average serving time for a person (min)	10	9	8,5	9,5	11	10,5	10	7,5	11,5	9,5
The average holding time for a person (min)	5	6	5,5	3,5	4	6,5	3	5	4,5	5,5
The average number of people waiting in line	50	48	55	52	46	59	37	47	45	54
The volume of money traded per unit time (thousands of RON)	105	103	110	114	98	93	126	108	99	101

In order to calculate the assessment indicator of a bank officer, there are considered the followings values of weights: $p_1 = 0,3$, $p_2 = 0,2$, $p_3 = 0,2$, $p_4 = 0,3$.

From Table 1 are determined the average serving time $AST = 9,7$ minutes, the average holding time $AHT = 4,85$ minutes, the average number of people waiting in line $ANP = 49,3$ and the average amount of money traded by a person per unit time $AAM = 105,7$.

Refining the metric for the evaluation of a collaborative system is a transformation process of a system with complexity C in another system with complexity C' , where $C > C'$ and the levels of representativeness of the two systems are not significantly different.

4. Experimental and comparative analysis

The Collaborative Multicash Servicedesk application goal is to store and process the customers' requests, solved by the Multicash helpdesk analysts within a commercial bank in Romania.

In the Collaborative Multicash Servicedesk application only authorized users have access based on a user name and password. The application administrator is dealing with the

access rights of each user, adding and deleting some users according with the bank security rules.

In the Table 2 is presented a report from the database of Collaborative Multicash Servicedesk application, regarding the categories of requests and their frequency in the period of 1-31 January 2010:

Table 2. Number of requests by category

Category	Number of requests
Add new accounts in the client application	26
Add new users in the client application	14
Other requests	132
User blocked on the communication	41
User blocked at logon	20
Communication initiated	54
Confirm account balance	71
Deactivate payments file	1
Error on starting the application	5
Signature error	46
Error on see statements	20
Statements export	1
Generate electronic signature	20
Index corrupted in database tables	4
Training on using the application	14
Training on see rejected payments	4
Delivery account statements	7
Delivery file with bank codes	12
Delivery files for distributed signature	8
Change communication channel	1
Change number of approvals / amount limits	1
Change name / address of payer	1
Move the application on another computer	13
Please repeat job with AC29	9
Reinstalling the application	7
Setting print parameters	5
Setting communication sessions	1
Training of branches for completing annexes	10
Transmission interrupted	36
Check payments status	162

In the Figure 1 is shown the representation of the customers' requests number, the data being taken from the Table 2:

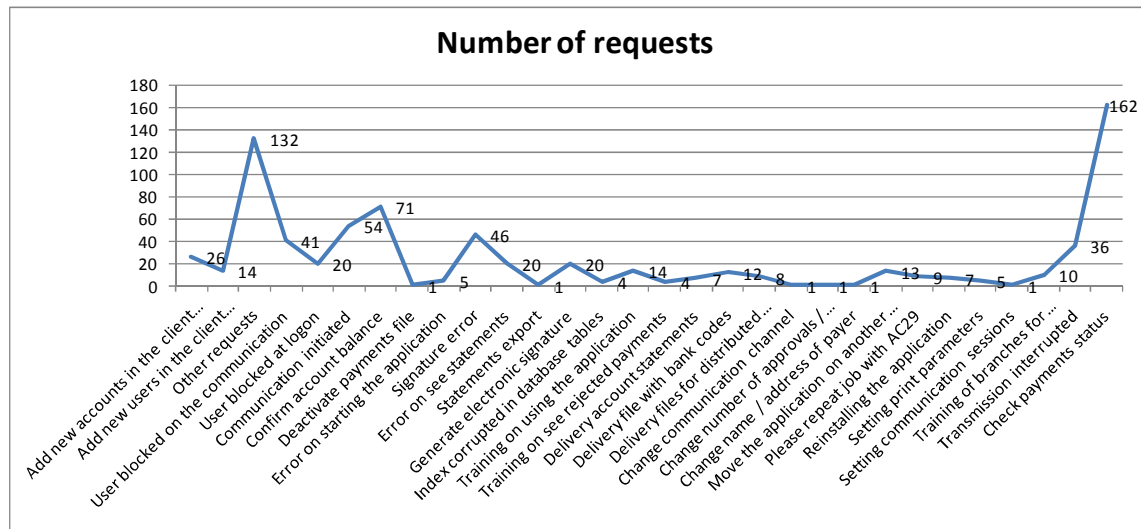


Fig. 1. The graphic for the number of requests

As seen in the graphic representation from Figure 1, the most frequently categories of problems are *Check payments status* and *Other requests*. This analysis show the problem of the Multicash system regarding transactions updates, which are not made in real time, the customers having problems in checking their balances.

Many of the requests registered on *Other requests* section can be moved to the others existing categories, because the helpdesk analysts have not correctly filled all the requests in the database. For the rest of problems remaining in the *Other requests* category is necessary to define new categories in the application.

There are considered Y_1 , Y_2 , Y_3 and Y_4 the analysts that are working with the Collaborative Multicash Servicedesk application in the helpdesk department within a commercial bank in Romania.

From the comparative analysis Analyst – Category of requests, on the basis of records from the Collaborative Multicash Servicedesk application, results that the analyst Y_1 solved requests from the categories *Add new accounts in the client application*, *User blocked on the communication*, *Generate electronic signature*, *Change communication channel*, and the analyst Y_2 solved requests from the categories *Add new users in the client application*, *Training on see rejected payments*, *Move the application on another computer*. Taking into account the number of requests recorded on each category, it follows that the analyst Y_1 has been overloaded.

5. Conclusions

Collaborative systems are efficient and achieve results accurately and completely if they work the way they are designed to.

In this article is achieved widespread use of indicators and is tracked the creation of databases that can be concatenate to increase the volume of necessary data for the analysis of indicators and collaborative systems.

The real problem is to apply the metric and most important to validate it. This will give the confidence that the values are real and the results are reflecting the actual image of the problem. Once the model is defined, it must be implemented in real development or maintenance cases and it must be tested. [7]

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