

Database Security for an Integrated Solution to Automate Sales Processes in Banking

Alexandra Maria Ioana FLOREA
Economic Informatics and Cybernetics Department
The Bucharest University of Economic Studies
Bucharest, ROMANIA
alexandra.florea@ie.ase.ro

In order to maintain a competitive edge in a very active banking market the implementation of a web-based solution to standardize, optimize and manage the flow of sales / pre-sales and generating new leads is requested by a company. This article presents the realization of a development framework for software interoperability in the banking financial institutions and an integrated solution for achieving sales process automation in banking.

The paper focuses on presenting the requirements for security and confidentiality of stored data and also on presenting the identified techniques and procedures to implement these requirements.

Keywords: interoperability, security, sales process automation, databases

1 Introduction

One of the current trends is the increasing cooperation between companies throughout the product life cycle. This trend is related to specific business needs such as the need to reduce costs, flexibility and product innovation.

As enterprises have to face increasing pressure to be open to new collaborations, integration, interoperability and external business processes with business partners, conducted under a common business network become essential. From the point of view of business applications connecting to business partners, access to data stored on mainframes, integration applications installed on different operating systems are just a few examples of situations where interoperability becomes an absolute requirement.

In previous research we have conducted a case study to create a development framework for software interoperability

in the financial/ banking institutions whose business is focused mainly on the retail area. This platform was created following the stages of a methodology we have proposed and presented in [1]. In each stage we followed the specific steps of data processes and software products integration, in order to minimize the influence of risk factors and to maximize interoperability and system performance.

The main steps followed in developing the framework are:

- identifying strategic objectives,
- investigation business process analysis and business process modeling,
- identification technologies and software platforms to be used,
- simulation and implementation models,
- execution and system monitoring,
- evaluation and optimization of the solution,

as shown in Figure 1.

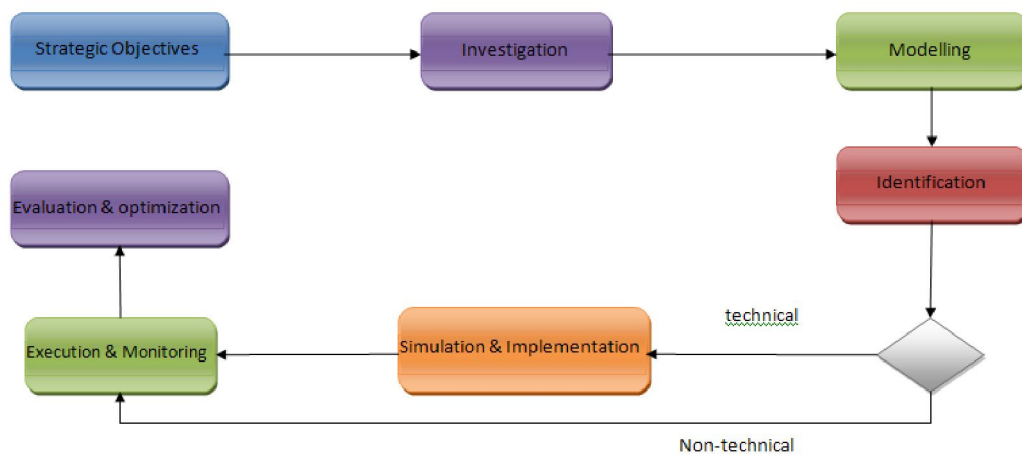


Fig 1. Proposed methodology for developing a BPM solution [1]

This article aims to summarize the developed framework, emphasizing requirements relating to the security database and the procedures and techniques used to achieve them.

2. Strategic objectives of the proposed framework

Retail banking has seen a significant expansion especially in the first part of the first decade of the XXI century this type of activity being relatively little promoted before. The main target was represented by corporate clients like banks and even those who gave greater importance to retail customers looked upon them rather as depositors, suppliers of financial resources, which were subsequently used for lending to corporate customers.

With the disappearance of the possibility for banks to place their money in government securities with attractive interest rates and the increased difficulty in attracting corporate clients, things began to change. More attention began to be given increasingly to the supply of credit to households. This shift in approach was helped significantly by the intense increase in household demand for loans. This demand has been in an upward trend until the end of the decade, as determined by the need and desire to purchase goods with long-term use or property without having to pay cash. This

resulted in a significant diversification of supply from banks that have introduced products increasingly attractive to customers because of the increased competition. Clearly, increasing competition among banking players means more benefits for the population that can benefit from more favorable conditions, lower interest rates and fees, but also because banks are forced to make their activities more efficient in order to meet market conditions.

Receiving a loan depends on the outcome of an assessment called scoring. This assessment is made based on an algorithm that takes into account many parameters that have different values for each client. The parameters included in the scoring calculation are assessed as having different influences in determining the risk associated with a loan so that each receives its own weight. These weights vary over time depending on economic conditions in the medium.

The scoring algorithm is used to identify and size the risk associated with each customer, depending on its features [2]. Based on the obtained score, each client is assigned a risk category such as very low risk, low risk, medium risk, high risk and very high risk. The score is inversely proportional to the level of risk associated with a client. A higher score implies a reduced risk associated with allowing easier access to a loan or even higher amounts.

The criteria scale considered in calculating

credit score and its associated weights are not constant. The changes that occur over time can be determined by several factors such as: changes in the degree of risk a financial institution is willing to take it for each client segment, micro and macro-economic conditions change, adjustments or corrections credit scoring model.

Given the fact that sales of credit type banking products involves a great potential risk for companies that offer this type of product is essential to have a sound and prudent management of the credit granting process. This will reduce associated risks and thus minimize the risk of solvency, liquidity etc. In order for financial institutions to operate in optimal conditions certain conditions need to be fulfilled that a bank wants to achieve by introducing automation solutions for sales:

- making the credit granting process more efficient by streamlining steps to minimize the number of components
- improve communication and coordination between users;
- implementation of standards based on good customer service.

3. Implemented business processes

The proposed solution offered modules and capabilities for

- Customer management;
- Management of offered credit products;
- Sales areas management;
- A flexible and easy to use module for the definition and interpretation of financial indicators;
- A module for loan applications management that includes: recording financial information of customer data registration guarantees deposited automatically calculating and interpreting financial indicators, keeping a history of scoring and prescoring simulations made on loan

applications, determine eligibility of loan applications;

- Lending Analysis module.

In addition to the expressed needs of the management of existing customers, there are some needs regarding lead management and sales opportunities and facilitate the qualification of potential customers (leads) to reduce the effort of agents to each client, resulting in increased number of potential new customers managed with the same effort and the same time. We want to achieve standardization, ease of communication, elimination of the redundant manual data processing and better control of the entire flow of generating prospects for management, so as to have consistent information in real time and can take corrective action to improve performance knowingly.

From the point of view of ensuring greater flexibility in the interaction with the system, there is the need to incorporate both mobile components and web-based interfaces.

Mobile components must operate both online (for synchronization of information) and offline, for situations where the user is out of coverage.

Mobile interface for agents (sales representatives) must provide functionality that would allow them to reduce the effort and the number of visits required for each potential customer. This includes the following modules:

- Data acquisition from the territory - allows the introduction of minimal information on an agent's new clients. This information can then be enhanced through the web-based interface.
- Prescoring - allows a quick calculation of the potential customer's qualification.
- Validating uncertain qualifications (online) - if we cannot obtain a decisive qualification for a potential customer based on the prescoring number, if there is connectivity to the communications network, the agent may request a loan officer validation or invalidation of that case,

automatically sending all information collected and may be notified if that potential client qualifies or not for credit.

- Products - interactive product catalog periodically synchronized with the central system. The agents can find information relevant to all products the organization offers.

Web-based interfaces will ensure access when users are not traveling. The solution will run on a server within the company and can be accessed online using a username and a password predefined by administrators from any computer in the organization. Each user will be defined as having a role in the system. Administrators can define access to the system for each role by enabling or limiting some functionality.

Agencies will have an interface within the online platform that can be used independently or as a complement coming from processed data on mobile devices. It is necessary to implement the functionality in the following areas:

- Potential customers: interface to view and edit information about potential customers.
- Visits processing interface: here the agent will see all of the latest visits after processing and generate requests to their loan officers on completing all the necessary information for a standard credit application.

Loan officers are designed to filter requests coming from the territory and to send them to central approval. Also they have a role in coordination of agents. Functionalities should be implemented in the following areas:

- View agents' requests: to allow viewing of all loan applications and related information coming from agents.
- Processing agents' claims: approval of this application by loan officers to lead to an automatic export of

data from the new system in the current credit management system used by the organization.

- Processing customer visits: to allow supplement the information gathered through the mobile interface of the territory on current customers to complete visits according to procedures.

Credit brokerage companies that are partners with the organization are designed to find and process loan applications in the field. They are both responsible for finding new potential customers and with filtering them so as to provide bank applications with greater chance of success. Implemented functionalities must include both those for agents and for loan officers in the input and processing demands of the market. These requests will arrive, as in the case of loan officers, in the central lending system.

Web-based interface for the management team should ensure functionality in the following areas:

- Tracking Agents: similar credit facilities officers, those in central can analyze in detail the macro or national or regional activity of agents
- Tracking the activity of credit officers: to monitor the performance of processing claims submitted by agents or tracking visits activity to existing clients of the loan officer.
- Other specific management reporting process.

The online platform must have a centralized notification module that can be used by all users of this platform (agents, loan officers, the management team). The system's aim is sending official notifications on processes and procedures of the organization with respect to the activity of generating leads.

In order to develop these components we'll apply solutions based on data integration, portal, business processes and services.

4. Functional requirements

Customer Management – the solution must allow the registration of three types of clients: individuals, businesses and

freelancers. This level will retain only general data on customers and for all customers we must be able to register an unlimited number of addresses and contacts, as well as the preferred means of contact.

Customers are assigned a sales area, and each client has a sales agent responsible for its management. This may be the responsible agent who handled the registration of client (owner) or another agent who was sent to the client. For each client the history of interactions with him must be visible.

Between different categories of customers we should be able to define relations like:

- Individual - individual: family / life partner / acquaintance;
- Individual - legal: associate / administrator / employer / employee;
- Legal - legal: branch / agency.

Also, for each customer record we must be able to attach files in various formats. These files will be stored in the

organization's portal, portal developed Sharepoint2010.

Management of offered lending products - The system must provide the possibility of introducing, by responsible, new product packages that the bank puts on the market and validation before they can be used by agents. Once placed, the products are subject to approval by the manager of the "credit products." department. If the product is approved for sale he enters the flow and can be used in the loan applications. Otherwise, it can be rejected leading to removal from the credit package offer. In this case the desired storage method if archiving the product for future reference.

For additional information about loan products the sales documentation are is used. This area allows attachment of useful files for agents and their management depending on the term of validity associated. The small number of additional documents linked with each loan product determines that integration with the portal to store these documents is not necessary.

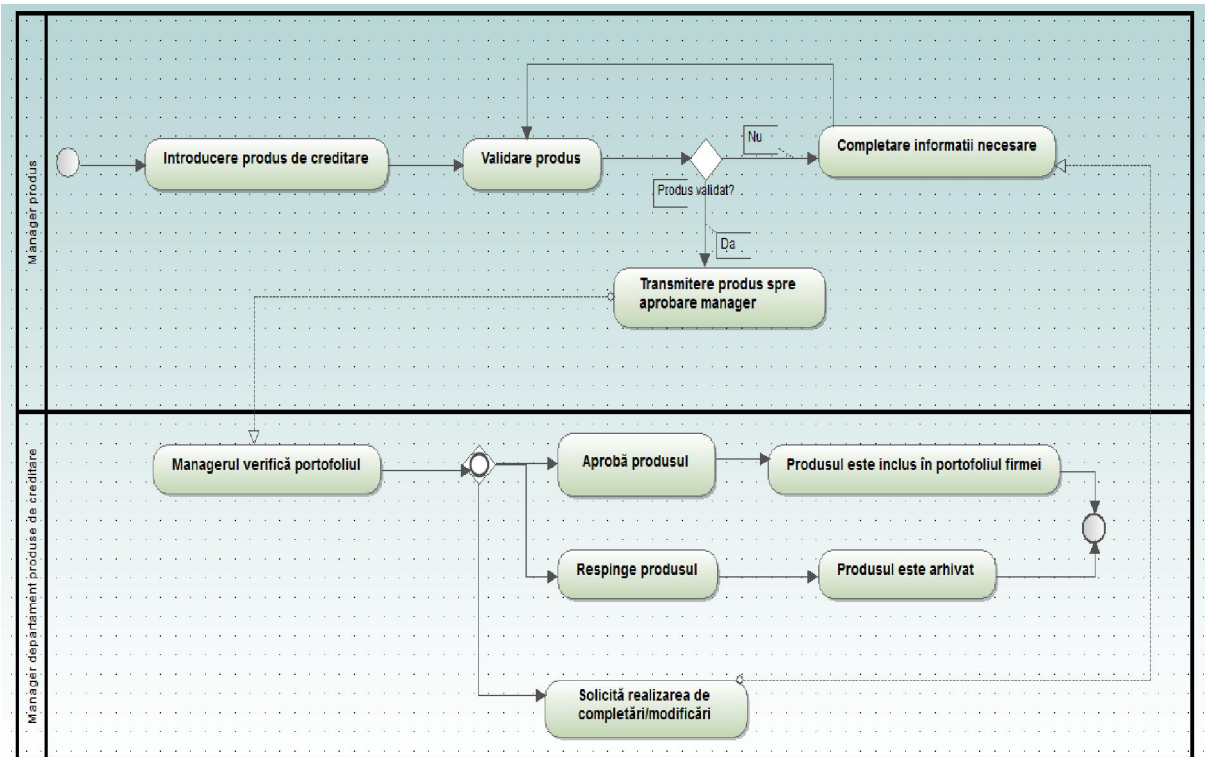


Fig.2 Lending products management process

Administration of loan applications – the solution allows the recording of the client's financial information, the set of information that must be stored being determined by the type of client. Records must allow the addition of parameters so that it can contain all the details of a legal organization, respectively all relevant data in financial terms for individuals. This information will be stored at the credit application level and not at the customer registration level as they are variable in time. Also, following the registration of financial information, we can register information regarding the offered securities. Collaterals are divided into categories/sub-categories, each collateral introduced requires an associated value and the type and amount of collateral may be used to determine the outcome of prescoring/scoring. All supporting documents relating to

guarantees will be stored in the portal. Simulations for prescoring and scoring can be made and the eligibility of a credit application will be determined. Eligibility is determined by the result of the last executed simulation. The solution will implement the company's prescoring and scoring algorithms, algorithms that can be modified according to market requirements. Eligible loan applications are submitted after prescoring to the credit bureau to determine their eligibility after scoring performance. After scoring algorithm calculation, calculating and interpreting financial ratios associates should be done automatically. It is possible that a credit application considered eligible when calculating the prescoring will be rejected after the analysis and scoring calculation. A history of all prescoring/scoring simulations conducted on loan applications will be saved.

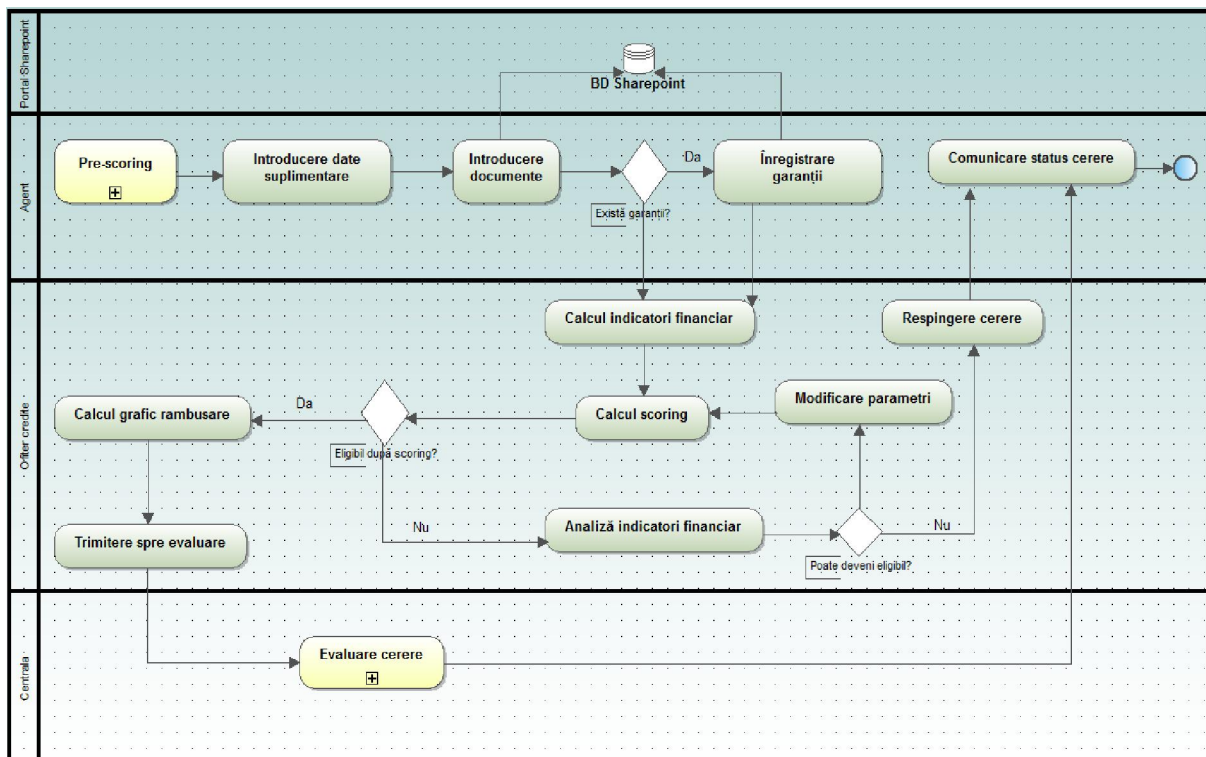


Fig. 3 Scoring process

Managing sales areas - sales areas will be the main spatial organization of business units. Sales areas overlap the main regions of the country, namely Moldova, Muntenia, Dobrogea, Oltenia,

Banat, Cri ana, Transylvania and Maramures. For each area there is a manager (sales manager) who supervises the work of agents in the area. Each sales area must be divided into sales territories and for each

territory there is a responsible sales agent. *Lending Analysis module* will lead to synthetic reporting situations that will help improve operations and performance. Statements may be obtained on the performance of agents such as number of meetings with customers or the number of requests made processed. It will also be able to evaluate the process of selling on a territorial basis by creating reports at territory or area-wide sale level.

5. Requirement regarding data privacy and security.

These requirements mainly deal with: how to access the system, security, data requirement (confidentiality, effectiveness), performance, flexibility and networking.

After investigating the particularities of the lending activity the requirements were divided into two categories: efficiency and protection of stored data and privacy and security.

For the first category the main requirement include the need to maximize efficiency by eliminating redundant work and delays, by facilitating communication, ensuring data integrity and by automating repetitive tasks and manual using appropriate technology. The system must incorporate on-line editing of data and contextual default values for certain fields to reduce the risk of errors and it must ensure the validity of data legally introduced based on legal provisions on the issue of communications. Also the system must be built to natively support the use of appropriate technologies to avoid the risk of data loss. The system must ensure backup and archiving processes, programs at various dates and times, repetitive or not.

The backup process will be done on the network drive, and the system must employ appropriate technology for recovering data from backup files.

In regards to the second category of requirements we have identified that the

system must prevent unauthorized access to confidential data, the identification of persons in all its functions: data entry and data changes, data transmission and storage, access to records, the creation of children. The application must ensure that information required reconfiguration flexibility, access control and data consolidation.

The application must provide appropriate access to users, ensuring the protection of personal data with authentication and authorization mechanisms and centralized user management.

The system must meet the minimum safety requirements for the processing of personal data provided in the Order of the Ombudsman no. 52/2002.

The application must allow for a certain group of users (in Back Office) access is exclusive to a particular type of request from the integrated solution, this portion can be set as inaccessible to other groups.

6. Solving requirements regarding security and privacy

To access the application a Web interface based on Windows credentials will be used. In order to gain access, the user will have to connect with a registered account in the dedicated domain. Checking credentials takes place when logging on to the workstation, so once logged in a user can access the application via the web interface, without the need to introduce other identification data. Once you open the application, each user can view data, but not all customers will be able to make changes. They will be allowed to process only customers they are responsible for. Interface accessing will be made using the Internet Explorer browser, which is the only one supported by Microsoft Dynamic CRM 4. If you want to use other browsers (Google Chrome, Mozilla Firefox) will use Internet Explorer add-ons.

System security policies are implemented using Active Directory (AD). Running AD servers are called domain controllers. Such a controller authenticates and authorizes all

users and workstations in a Windows domain network type. Through Active Directory all suitable users are identified as part of the application it is stated and implicit right to work with it. When a user logs on to a workstation that is included in a domain, AD verify password entered to determine whether the user has the role of administrator or regular user.

User passwords must meet a set of security policies, namely:

- Have a size of at least 8 characters and contain at least one letter pattern, a digit and a special character;
- Password should be changed after not more than 31 days but no sooner than three days after the last change;
- It will store a history of passwords used so the same password cannot be reused until after 12 changes.

Users need to be grouped into roles and data access will be restricted based on these roles. Also there must be a possibility to share data so that users can get access to objects that do not belong to them, in order to accomplish various tasks in cooperation. When an employee leaves the institution, the user rights of the respective will be deleted.

Back-up strategy is dictated by the standard CRM policies and back-up implies a full week and a daily incremental backup. The latter achieves storing transaction logs at the end of the day. There will be two back-up media, one locally, in the IT department and one outside the department, in a disaster recovery center.

The backup process will be done on the network drive, and the system must employ appropriate technology for recovering data from backup files.

The archive will be on optical storage media (DVDs) or network drive.

For DVDs, they will automatically receive an ID generated by the system. DVDs archives will contain cases (data

sheet in .pdf format) and not native portions of the database. When searching for a case that was previously archived on DVD, the system must provide the ID of DVD on which it is located.

If the volume of data to be archived is higher than the capacity of a DVD, the system will burn, in turn, all DVDs needed. Each DVD burner will have its own ID.

Archiving process must be transparent for the supervisor.

The system must leave it to the supervisor if you delete or not the archived information from the database

However, the system will allow the restoration of records in the database using records made up to that point.

To ensure the availability and security of operations, there will be regular monitoring of all systems and servers that contain confidential and secure information and checks of the available capacity. Servers must be protected and tested prior to any modification.

All information regarding access and attempts to access the system will be stored in order to identify unauthorized access. There will also be recorded and retained for a predetermined period all security incidents, in order to achieve access control and audit in order to investigate possible errors.

Data requirements, deal with issues such as consistency, confidentiality and efficiency. The solution offered should enable managed information assurance. It will be taken to ensure the uniqueness of information entered into the system by using tools for identifying and eliminating duplicates.

Performance is measured by the number of users that can use the solution and the time required to extract the information. The solution should allow for the simultaneous introduction of data by at least 1200 users.

The flexibility of the solution translates into the possibility of further development and optimization at both the hardware and software level. The system should permit better technological solution chosen to be built after deployment in a cost effective

manner. In order to upgrade the software level, the solution uses Microsoft Dynamics CRM 4 in native mode for transferring customizations to the latest version recently appeared on the market, Microsoft Dynamics CRM 2011. Document management portal is developed using the latest available version of Microsoft SharePoint. In terms of hardware, the system can be scaled vertically by adding processors and RAM on existing servers.

Interconnection with other systems must assume that the solution will allow data transfer and communication between interface developed in CRM and the SharePoint portal of the organization. In addition the solution must enable data export in Excel format. The solution integrates natively with Microsoft Exchange and Active Directory, and Microsoft Dynamics CRM integrates natively with Outlook and other Microsoft Office applications suite.

Conclusions

The solution is mainly dedicated lending management, achieving this integration of two elements commonly used in current organizations: a solution for customer management and business process that involves (Microsoft Dynamics CRM 4.0) and an online portal for document management. Security of information from the project refers mainly, but is not restricted, to six main components: confidentiality,

authentication, authorization, integrity and non-repudiation logging.

While developing the application and the security measures, not only the possible external threats were taken into consideration, but also the potential vulnerability from the inside, one of the most neglected aspects when dealing with security issues.

References

- [1] A. Florea, "Business Process Management Solutions Performance Tuning and Configuration", *Database Systems Journal*, Vol II, Issue 3/2011, September 2011, ISSN 2069-3230, pp 23-32
- [2] X.Xu, C. Zhou, Z. Wang, "Credit scoring algorithm based on link analysis ranking with support vector machine", *Expert Systems with Applications*, Vol 36, Issue 2, March 2009, ISSN 1468-0394, pp 225-2632
- [3] A. Lane, *A Database Security Management White Paper: Securing the Information Business Relies On*, 2012, <http://www.technologyexecutivesclub.com/Articles/security/databasesecurity.php>
- [4] A. Bara, A.Florea, I.Botha, S. Oprea, "Solutions for CRM systems integration in organizational systems", *The 1st WSEAS International Conference on CLOUD COMPUTING (CLC '12)*, Vienna, Austria, November 10-12, 2012



Alexandra Maria Ioana FLOREA (born 1984) has graduated from the Faculty of Cybernetics, Statistics and Economic Informatics of the Academy of Economic Studies in 2007 and also from the Faculty of Marketing in 2008. Since then she is a PhD candidate, studying to obtain her PhD in the field of economic informatics.

At present she is pre-assistant lecturer at the Academy of Economic Science from Bucharest, Economic Informatics Department and her fields of interest include integrated information systems, information system analysis and design methodologies and database management systems.