

2013•2014
FACULTY OF BUSINESS ECONOMICS
Master of Management: Management Information Systems

Masterproef

Business process modeling in the cloud

Promotor :
Prof. dr. Koenraad VANHOOF

Aziz Yarahmadi
*Master Thesis nominated to obtain the degree of Master of Management , specialization
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Preface

My research has been focused on the field of business process modeling, one of the major prerequisites of Management Information Systems. This study will be applicable for the managers trying to coordinate business operations and activities and it tries to create an image to find out the various facilities of cloud computing to model business processes of a company.

This research has been done in my Master of Management program at University of Hasselt during the academic year 2012-2013 and it is a compilation of literature review and surveys on how to use a cloud solution program from Cordys Process Factory ©. I have tried to build up knowledge on how to work with the platform and evaluate the performance of it based on the options available and deficits that exist because of rapid change in business operations requirements of the companies and customers.

I would like to thank my supervisor, Professor Dr. Koen Vanhoof for helping me during all sections of this study and I hope it would be useful for everyone interested in applying cloud computing in management and business. I would also like to dedicate my master thesis to my dearest parents, who have always been there for me during every step of my life and my beloved Farnaz, who I see everything charming through her eyes.

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Summary

In this study, I have defined the first steps of creating a methodological framework to implement a cloud business application. The term ‘cloud’ here refers to applying the processing power of a network of computing tools to business solutions in order to move on from legacy systems. I have introduced the hardware and software requirements of cloud computing in business and the procedure by which the business needs will be found, analyzed and recorded as a decision making system. But first we define the constraints of the study.

This study begins with an introduction of cloud computing in the context of business. I will clarify the changes in the business environment and the need for systems are able to respond quickly and accordingly. I have introduced the benefits of cloud computing utilities compared to old interaction systems, in the form of the way they influence operations and activities. I will determine the competitive advantage the company using cloud technologies has over the rivals. These advantages are in the form of accessing information, cost, time, customer royalty and income.

The study then discusses the technologies got to work or developed as the foundation of cloud computing. These technologies consist of special hardware and software that have been discussed in details. We will then look into the functionalities of each business application. Each proposed application should satisfy the business requirements according to internal and external affecting factors in business. Internal factors include the strategic macro decisions, micro functional decision making strategies, human resource management and generally everything that changes the company potential from inside. External factors and those factors that change the business environment from out of the company like government policies and competitive rivals. The business application should be able to respond quickly to every required functionality caused by internal and external factors. So the analysis of requirements should be focused on both the capabilities of the company and the market.

After discussing the changing situation in global trade market I will introduce the Cordys Process Factory platform and try to illustrate the capabilities through implementing some business requirements of a typical company in Iran. This company is active in Petroleum industry and has recently moved its functionalities toward cloud computing. This company has simple and complicated business processes and applications for different unit. I will implement some of these applications in order to illustrate the cloud

computing abilities that Cordys Process Factory has utilized in their platform. We will discuss the abilities of the platform and also criticize the vulnerabilities to generate a clear image of how these services can be provided better.

At the final stage of this study I will try to conclude the experience and literature study into a single analysis result in order to connect the ideas of developers, application service providers, users and corporate management.

Methodology

Following the literature review method and in order to explore the design procedure of cloud business applications exercising cloud computing options and technologies, a series of steps has been presented in this study.

At first step I will try to build up basic knowledge on the evolution of business systems dealing with managing dilemmas. I try to find the necessities of change in solution systems due to change in nature and number of requirements. The main research goal here is to find reasons to the dilemma of being attracted to cloud computing based platforms. In another words, we can ask the main research question as: What are the radical changes in business environment from the functionality options perspective, that make customers consider moving their applications from separate machines into cloud? I will first introduce the new features of cloud computing capabilities from business plans and activities point of view. The benefits of having access to more options and the fact that various pricing plans are in line with the idea of diversifying in investment and development of business, will be discussed.

The next step of this study will look into the new functionalities of cloud business solutions. At this stage I will try to address the concerns around the idea of leaving old semi-automatized decision making and solution providing systems for cloud services. In this context the introduction of change management and preparing infrastructure in every aspect of business are the main focus points of discussion. The question here will be: Are new features of cloud business solutions attractive enough from the cost-benefit strategies point of view to managers to move from traditional business development to cloud application development? At this stage I will apply an analysis framework, determining different potentials of a business solution providing platform, from analytical and technical perspective. This framework, looks for potentials and weaknesses of the platform and helps considering future research in order to improve the functions of platform.

We need to follow an evaluation approach which fits our methodology best. One approach is called goal-based evaluation. This approach concentrates on evaluating introduced features from creators and

measures the degree of their objectivity in case of handling business operations and activities. This evaluation is also famous as the object oriented approach.

Another evaluation approach is based on literature study and the fact that all business solution providers have similar capabilities and tools to handle business operations. These similarities let analyzers find evaluation criteria in order to compare products on the basis of mutual features. Generally, most of business solutions consist of a business process management and analysis package, data gathering and data mining structure, definitions of situations in which tasks are planned and activated, roles are created and results can be assessed and finally facilities to plan tasks and estimate and allocate resources to those tasks. Therefore, selecting criteria for evaluation approach is based on measuring features related to these functions. The research question here is: What are the main criteria and their subset features to test in each application in order to assess essential capabilities in every business operation? I will discuss the definition of criteria in detail in order to evaluate the performance of Cordys Process Factory. I will introduce measurement criteria after the introduction of business application. Then by implementing each part of an application in Cordys Process Factory, we will be able to apply measurement framework on Cordys Process Factory features. Finally, we will talk about the existence and performance of each measurement criteria in the conclusions section.

Logically, the idea of developing an application based on an assessment of pre-requisites and potential capabilities comes later, when the concept of the application is well discussed and typical parts of business application are presented. The research question here is: How is the procedure of designing each part of a business application? The design framework will try to investigate the relationship between supplied information and the systematically improved usage of information in the form of creating templates or objects, which act as the backbone of the application.

When defining the procedure of modeling businesses, it is reasonable to do this using a case study. The case study here is the business environment of Arvand Company in IRAN. A case study in our research field has some important advantages. While cloud solutions are brand new, there are little experiences on how to model a specific business case and furthermore, implementing the structure as applicable business rules, plans and schedules would not be that easy. The case study makes it possible to explore the field and classify the steps in a proper manner.

Data about the case study is gathered by studying management guidelines, financial statements and interview with a member of the board of the company.

The case study here consists of different business activities, mostly concerning the relationship with suppliers and customers. It is important to notice that Arvand Co, as a producer of coated pipes for liquid transportation, needs raw material provided by different suppliers. Ordering such material is a responsibility of financial and commercial manager. There are also payment rules that are defined for certain cases. Also interacting with buyers and transporting the final product is an important part of Arvand Co. business plan. So here in this research the dedication of resources according to degree of significance would be explained and the business processes in buying raw material, the relationship with suppliers and customers and other rules would be defined. It is also important to note that Real time reports are needed by management, and employees at the factory update the stock information multiple time a day. So here we will use information from management unit and factory employees to model processes.

Introduction

In the unclear and rapidly changing environment of business, companies need adaptation strategies in order to estimate customers' requirements and respond accordingly. These strategies deal with incumbent technologies, unexpected changes in plans and requirements and deficit estimation of time and resources needed. In order to meet the expectations of clients and to keep business running, senior management of a company is expected to leave old and steep methods of designing several packages which took long time and also required recruiting highly-paid application developers in order to turn implementation concepts into executing applications and programs.

Scalable IT infrastructure is a necessity for every company. Nowadays time is much more limited to design systems and platforms for every new client from scratch. The ability to expand features and options of a platform in order to comply with new business needs of a client is considered to be a competitive advantage for a business consultation firm. While other rivals are busy developing automation tools based on legacy methodologies, new software and hardware capabilities and technologies, along with the power of reassessing situation, gives IS departments management the chance to turn their company into the industry leader. In order to achieve such a goal, it is first necessary to interpret functionalities of every type of business to turn them into logical concepts which are recognizable for system developers and business analysis. Then a main processing unit is needed to be designed which is a constant functional unit in every application and each application will need it. By developing such object for business functions and processes which exist in many applications, developers try to keep the cost and time needed for designing business solution down.

Several technologies has been used to implement business intelligence solutions. The definition of "Business Intelligence" or "BI", according to available set of definitions and explanations is: "A set of methods, procedures and technologies that help turning raw data into useful and meaningful information to business people". A simple sample of raw data in business context is a spreadsheet of different parameters which represent various features of a bank customer. Business analysts use data mining methods and software to turn those meaningless numbers and statements into financial information which will help them assess each customer credit capacity.

Now that business intelligence is a meaningful concept to recognize, it is time to consider the fundamentals of “BI”. Along with BI, establishment and improvement of cloud computing upgraded BI as a concept. Cloud computing or generally “Cloud Concept” is the set of tools that take charge of data processing and loading and retrieving information-all in cloud-in the desired format for the user. Cloud computing in the field of business analysis consists of hardware, software, technology and storage units that exist on a service provider server site and client’s responsibility is just to provide raw data.

”Virtualization” is the name which has been given to this functionality. “Virtualization” is the procedure of coordinating virtual hardware, software and processing units somewhere else rather than client’s site and by virtualization, we mean not just virtual machines running on different operating systems, but we also consider cloud running machines. The term “Cloud” refers to virtual processing and storage units kept on multiple servers which are connected together and to user’s machine using internet or a specific intranet.

Virtualization brings competitive advantage over rivals for a company. The first item on the list is information security. The cloud service provider is responsible to generate data backups and to prevent unauthorized access to business data. The other advantage is data integrity. Also great ability to process big loads of data is usually provided by server-side applications and machines. Virtualization also brings cost reduction even in personnel recruitment and providing dedication buildings as space for personnel and platforms. We are talking about an environment in which there is no sign of physical contact and many employees are working far from the company, even from home. According to a study by Cisco, providing an environment in which cloud computing takes control of designing solutions, reduces costs \$277m annually. In another study by Stanford University, it has been found out that working from home, thanks to cloud computing tools, increases personnel efficiency by %13.

Cloud computing tools are also fundamental means of designing “decision support systems”. In fact, cloud decision support systems, like the one IBM has developed in healthcare systems, are so reliable and can provide and share information on demand and in real-time. The mentioned decision support system from IBM checks over a patient’s treatment records and sends information to specialists associated with the patient. Cloud decision support systems help decrease the costs of keeping and transferring data and they provide access to data at any time with high information security and integrity.

Cloud applications in business, similar to non-profit sector, are of great value to management. They make it easy to share data in planning, reporting and user query. Multiple “service-level agreements (SLAs)” are

defined in services provided by application service providers (ASPs). Service level agreements clearly and formally define a service. In these agreements the duration of service, units, articles and functionalities which will be supported and the associated costs will be defined. All of these service level agreements which has been accepted by both parties are defined on the basis of an assessment of company's business needs.

Each enterprise has different cooperated sections or units which mutually interact and their needs should be assessed with a view of all interacting units. It should be defined which functionalities are asked from units and which type of raw data is consumed by analysis methods in the unit. Step by step, this procedure should be able to track the flow of data and legal authorization in the company.

1 The concept of “Business Application”

The methodological procedure to confront business complexity in day-to-day business functions leads to creating and developing “Applications”. Based on associated literature review, the so called “Applications” are a set of functions gathered to provide tools for receiving real-time information, defining access credentials and responsibilities and simulating business processes. Each Application consists of 7 different parts. Here we define them using a bottom-up approach.

1.1 Application Objects

Each application needs to interact with a set of clearly defined entities which are meaningful to it. Without these entities, the application is not able to find parameters and variables which are used and changed in order to process data. Application objects compose the foundation of the application. The application, using objects, will be able to implement different structures and functionalities on data, in order to achieve business goals. Application objects in the context of business application, are like bones and muscles in a human body. One can use a muscle to lift weight. In another situation, the same muscle, along with other muscles can be used to push something or use a pen to write something. As we see the muscles are entities which perform different tasks and application objects can be imagined as entities which exist and different scenarios, compose different activities or functionalities. Objects can be of different numeric or non-numeric types. For instance, dates, time, binary or integer numbers, comments, selection choices and web browser cookies are all different types of objects. Application objects are unique in context and each of them identifies a relationship with an identifying field of information. Objects also define relationships between generalized entities like procedures and tasks.

In Cordys Process Factory, however, application objects can be generated automatically during the development phase of application. For instance during designing a web form and by adding a single line field for adding a purchase order ID, a unique object with a definite string length and name of “purchaseorderID.obj” will be created. This object in next step may develop the relationship between the

tasks of creating a purchase order and creating a management report where it will be used to define the ID of a purchase order in a report created by production unit and sent to senior management.

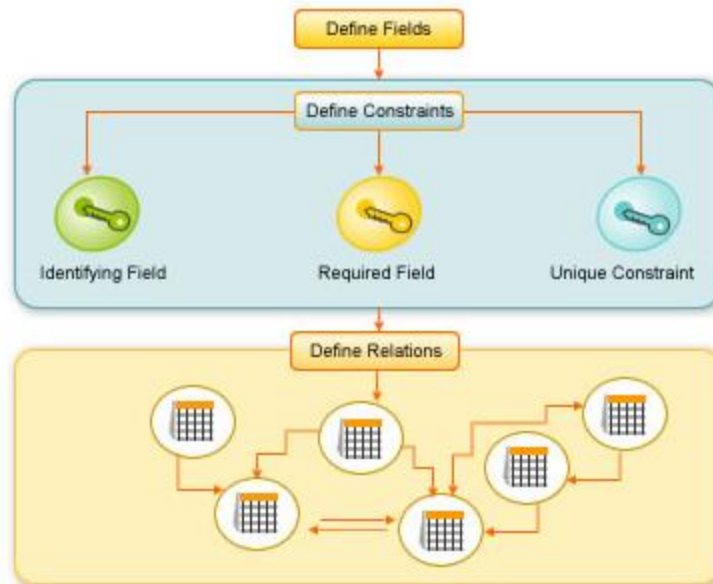


Figure 1.1 : The Concept of “Application Objects” /Source: Cordys Process Factory

1.2 Forms

Forms are built to read data from external systems. A Form consists of different fields structured by objects that can be filled by users to gather information. A simple form can be built to produce a record of the time and dates that employees spent on a project. These fields are types of data that are filled by employees and then are used to create payrolls and invoices. For example in the required fields, the developer can create the “Name of the Employee”, ”Number of Days Worked” ,”Age” ,”Address”, ”Unit “ and related subjects that should be filled by the employee.

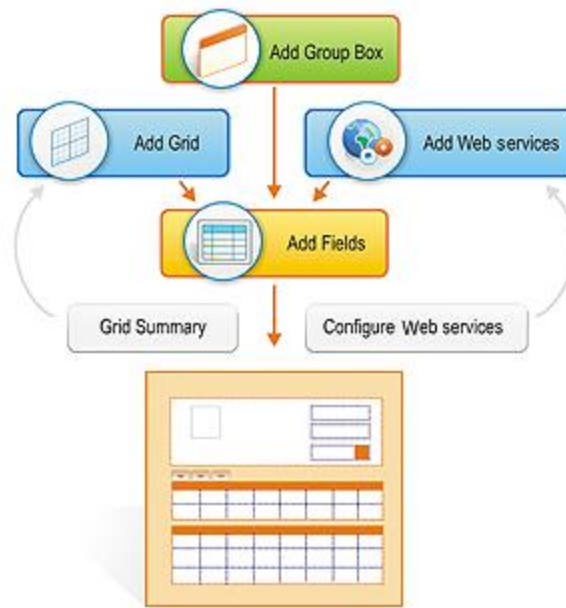


Figure 1. 2 : The concept of “Forms”/Source: Cordys Process Factory

1.3 Business Processes

Business Processes are a collection of tasks or related activities that lead to providing a service or a product. In Cordys, like most of other business process modeling tools, we use BPMN to implement flowcharts to visualize a business process. Whenever the user defines a task or decision, it is possible to simply define constraints, which lead to path selection in a business process.

Constraints are defined by simple mathematic notations. Expressions like if-then rules are also available to use by dragging and dropping the symbols in decision configuration box. There is also trigger events that trigger the business process by predetermined events. The event can be inserting, updating or deleting information.

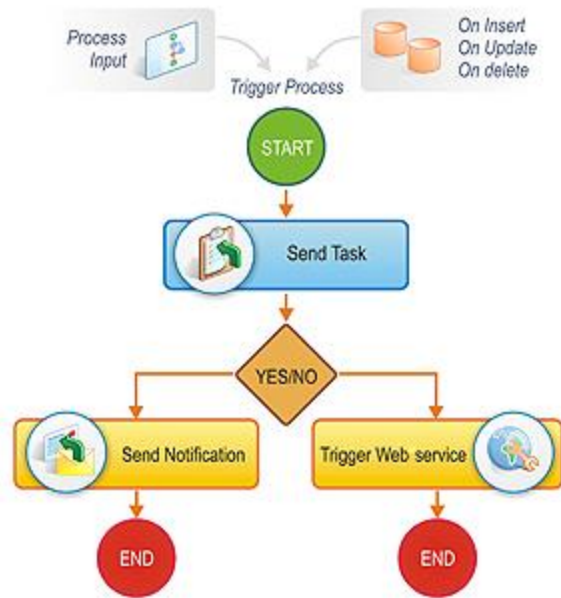


Figure 1.3 : The concept of “Business Process”/Source: Cordys Process Factory

1.4 Business Rules

Every business, like every organization, needs rules. Rules are the basis of business concept. In order to define the level of interaction between parties, the level of investment in requirements and projects, personnel compatibility and recruitment and generally every detailed aspect of business that helps the business entity reach a goal.

In order to imagine a business rule, we can think of a certain situation in a company. Whenever a rule has defined that every employee in a unit needs to be at work for at least 40 hours per week, this is applied to paycheck issue and no employee will receive a paycheck without checking working hours per week. In another words, while corporate strategies in a company define organization goals at senior level, business rules provide detailed behavior applied to different units and cases in daily activities.

Business rules may be defined before, during or even after starting the business. Every business case related to customers may specify a lack of information or analysis methodology in a special case. For

instance a customer may want to outsource part of its business functionalities. The business solution provider may not be familiar with pricing in such a situation. It must be defined whether the customer must pay for what they have used or for a fixed price plus overload use.

Similar cases bring the need of defining new business rules. It is also important to note that not all business rules are written down nor recorded. Many of business rules are just informal notices which employees and the manager consider while treating a case. In this context, there may be the need for extracting all formal and informal rules from use cases, situations or documents and record them in rules databases. This procedure is known for “Business rule mining”. By analysis of procedures and corporate behavior of the entity, designing the business rule databases reduces the time and cost of response to unique requests of customers.

Business rules, in the way we try to describe and implement, can be expressed in new business process modelling notation (BPMN) language. In Cordys Process Factory, it is also possible to define business rules by defining mathematic equations. As it was explained before, application objects act as the fundamentals of the application. We define mathematic relationships using related application objects. For instance, imagine we are trying to keep track of reports sent to the supervisor from employees. It should be clearly stated who, from which unit, on which date and with which subject has generated and signed the report. In this case application objects “Name”, “Date”, “Unit” and “Subject” should have been considered and values should be assigned to these parameters. Now we can define the business rule in mathematical terms.

/IF “Name” AND/OR “Unit” = blank

/THEN

/SEND ERROR MESSAGE

/AND

/SEND EMAIL TO THE MANAGER

This business rule asks user to fill the fields completely and if “Name” or “Unit” is left blank, then the operation would be terminated, an error message is sent to the user and a warning email would be sent to the supervising manager.

A complete set of business rules acts as a policy guideline for a company. Having access to a roadmap in daily activities as soon as it is needed, unlike the old legacy systems of decision making, are of great advantages of cloud computing in business solutions.

In this context, I have defined business rules in a way that adds value to the idea of applying Cordys Process Factory to business solutions. I have explained the complete procedure of designing a business rule in Cordys Process Factory.

Now we discuss the data transition means in case of cloud computing. There is a need for protocols which provide the data transfer technologies. These protocols form web services. Services which are based on web technologies and make generating and manipulating information possible.

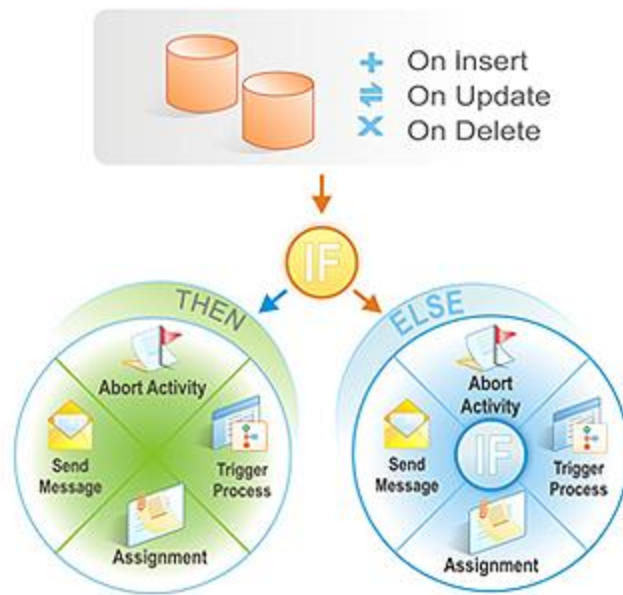


Figure 1. 4 : The concept of “Business Rule” /Source: Cordys Process Factory

1.5 Web Services

In order to develop services offered by cloud computing, “Web Services” has been developed. These services are system software and technologies which provide the availability of communication between hardware and software. Web services are usually configured using WSDL. “Web Service Definition Language” or “WSDL” is an XML based language trying to create connections between machines which are interacting in the form of messages that usually contain processing information.

In cloud computing, web services may either send information toward an endpoint, which can be a processing unit, an analysis unit or just a user or may bring back information from one of mentioned units.

In Cordys Process Factory, a simple web service can send different kind of messages between users at any level. These messages can be error messages, warnings, notice emails or acknowledge messages. Another type of web services sends or receives SMSs, created by system in order to inform a user of changes in situation.

A simple overview clarifies the image of web service as the connecting infrastructure of cloud computing. Separate applications on each computer may perform orders and operations in an efficient manner. But this is the ability of connecting processing machines and creating a workgroup network that distinguishes cloud computing from discrete data processing.



Figure 1. 5: Working with “Web Services” in Cordys /Source: Cordys Process Factory

1.6 Reports

Acquiring status reports any time from any place is a winning advantage for cloud business solutions. In production unit for instance, the senior management wants to know if the units has reached the planned production level. In another case, the senior management may want to know if the financial department has finished generating the 3rd annual quarter balance sheets.

Cloud computing makes it possible to produce reports at any time. Before starting a procedure, during the analysis of data and after the procedure is over or terminated.

In Cordys Process Factory, the report generating utility creates a criteria of data types which user needs to be selected and analyzed. Then it is possible to apply a filter on data to select data types which management prefers to see on report. For instance there may be 4 types of data in a company: financial, production, sales and logistics. The filter may be used to put just sales and logistics data inside the report. At the last step of report generation wizard, the user designs the layout of report. The layout contains the format of data visualization in the form of graphs, charts, tables and amount of data that the utility records in the report.

In order to run a report utility, management may want to ask immediately for the report wizard to generate the report or run it on a scheduled time. Planning utility will be responsible to perform this operation along with performing other orders.



Figure 1. 6 : Working with “Reports” in Cordys/ Source: Cordys Process Factory

1.7 Schedules

Starting activities on a schedule is an undeniable part of every business plan. Customer credit checking, report generating, periodic financial data analysis along with warehousing procedure are just a few examples of operations which need to be planned using a schedule. A business schedule in legacy systems was in form of a document, a reminder or from a supervisor asking for running a task. A simple business schedule may be triggering a process. This process can be a recruitment process. For instance, the schedule may be set to trigger the recruitment procedure of a company every 6 months. In this triggering activity, it must be clearly defined when and in which unit, which type of work force and for what type of activity is being hired. In another words, a schedule has details to be provided

With cloud computing tools, however, defining schedules is easy. Like business rule database, a schedule database may be designed to keep schedules and run any at a desired time. Details in cloud computing are a set of constraints to run the recurring event-the event which will happen many times- exactly and in a well behaved manner. These details are inputs, targets and schedule identifiers.

Inputs define which type of data should be inserted as input in a schedule. Schedule identifiers or details define the name, run-time and recurring event which is planned to be executed on that time. Finally it is needed to define which process, report or any other business activity needs to be done as the target of the schedule.

Schedules in cloud computing solutions, lower the time and cost of planning. They also facilitate the analysis of data in the form with using predefined application objects. There is no need for coding anymore.



Figure 1. 7 : “Schedules” in Cordys /Source: Cordys Process Factory

2 Business case introduction

ARIA ARVAND Coating Company is the first and leader company in concrete weight pipe coating industry in Iran. It was established in 1999 in an industrial area in south of Iran. In order to get familiarized with the company's functionality we shortly name it AACC.

AACC is the provider of heavily concrete coated pipes which are used in transmission of the petroleum products from sea back to the shore. In order to extract petroleum from sea platforms and to send it onshore to be processed, it is necessary to produce pipes which should be first heavy enough so they would not be moved by sea waves and to also be insulated so they would not be ruined by sea water because of staying at the bottom of the sea for a long time.

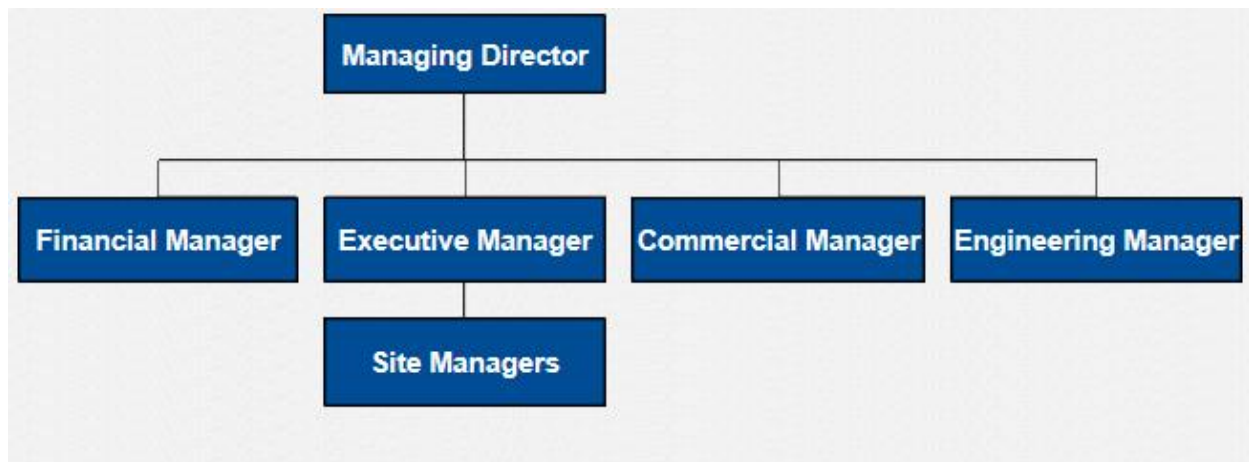


Figure 2. 1 : Organizational chart of Arya Arvand Coating Company (AACC)

In order to insulate the pipes, the company needs certain raw material:

1. Bare pipe
2. Enamel cover, which is a melting coating layer
3. Primer cover: functions like Enamel

4. Raw concrete: is being added to both insulate and weight the pipes
5. Wire Mesh (Cage): functions like an infrastructure for the covers and concrete
6. Anode bracelet: which is installed for cathodic protection

The production of insulated pipes in the company follows a procedure that has been explored and discussed below.

2.1 Load In

The production process is started when bare pipes are received from provider's site and are deposited on company's incoming pipe rack using cranes and trucks. Then the surface of the bare pipes are cleaned with hot water.

2.2 Enamel Plant Process

Cleaned pipes enter the next section which is the "Enamel plant process". This process starts with heating and drying pipes. This procedure makes sure the pipes are ready for entering the cleaning chamber. After that and on the rotating buggies, pipes will be shot blasted at a high speed using steel shot, grit, or a combination of both. After that pipes will go out of the conveyor and will be inspected by the "Quality Control" team. Then pipes are rolled again over the rotating buggies and "Primer" will be sprayed over the whole external surface of the pipe. Afterwards, "Melted Enamel" will be fallen over pipe surface and also inner and outer sides will be wrapped using a protection layer. Protected pipes must be cooled down to be hard enough. This will be done using "Water Sprays" over the surface of the pipe. Then pipes will be brushed to keep and preserve them from water. A "Holiday detector" which looks for cracks and holes in the surface will finish this section afterwards.

2.3 Concrete Weight

Pipes will enter “Caging area” afterwards. Where “spacers” will be installed on “metal cages” on the outer surface of the pipes. ”Concrete Application Unit” is the next stopping point. Where the “Impingement machine” throws concrete on the pipe while the pipe is rotating at a predetermined speed. Then a “wire mesh” will be applied to the outer surface.

2.4 Anode Installation

“Anode bracelet” is the final material installed on the pipes to provide cathode protection .These bracelets will usually be added on the both heads of the pip by pulling chains or cables or even using hydraulic press.

2.5 Final Stock and Load out

Finished pipes will be loaded on the load site where they will be kept under predefined humidity and pressure conditions. Coated pipes will be then sent to customer’s site according to contract details.

3 Business case implementation

Following the methodology used in this study, here I start to analyze the case study of the coating company. In order to explain what exactly each step include, it is better to explain a business unit. Each unit is composed of a Manager and some agents which report the situation and estimate different needs of the units. For example, in order to confront running out of raw material, the production unit agent estimates the needed raw material of every type for a period of time and then sends an estimated purchase order to the manager. Other units may need this functionality.

So the first step to develop the application is to develop a “Form”. A “Form” is used to provide different fields of information by the user and could classify the data according to managers needs and in this way it could be easier for the manager to decide on it.

The next step is to set up the “Organization Data”. Here it is possible to assign tasks to different roles. For instance a supervisor would be responsible to send “Quality Control Reports” to “Quality Control Manager” and this task is assigned to the supervisor.

In the next step, different “Business Processes” would be modeled and instantiated to explain the flow of data in each process and the unit.

The fourth step is to create “Business Rules”. A “Business Rule” for our typical company could be that the “Financial Manager” is responsible to track payments of the customers and he is not eligible to balance the “Account Payable” or “Account Receivable” accounts without actually receiving the payment in cash or credit. This means the “Accounts Receivable” amount should be felt before the accounts are balanced.

“Sharing and Packing” the application is the final step during cloud modeling using Cordys. This procedure helps us pack an application and set privileges for users to have access to the application. Here again, different roles determined before are in place.

After finishing the building process of an application it is time to build “Reports”. “Reports” help users represent data in a meaningful manner. The CEO of the company may ask for a report on sales for the previous fiscal year and sales manager would build that report using report wizard. Each of these steps would be explained in details.

3.1 Developing an Application for “Production Unit”

In order to get familiarized with the procedure of building an application we implement the business functionality of “Production unit” and different steps to develop the application for this unit.


3.1.1 Building the “Forms”

We start by building a form for production unit. Where production manager creates a list of needed “Raw Material” and then prepares a “Raw Material Purchase Order”. There are 6 types of “Raw Material” used in production process. “Pipes”, “Wire Mesh” which is a round covering metal network, “Enamel” which is the main covering material, “Primer” which is used to absorb “Enamel Cover”, “Anode Bracelet” which is used for cathodic protection, and “Concrete” which is used both for gaining weight and protection.

In order to build the form, a unique “Raw Material Purchase Order Number” is needed. This number would be of “Auto Number” field type. This number would be automatically created after saving the information. A “Form” may have an individual logo. The specific unit and the responsible person should be identified for further decision making.

In the next section, we specify the date of the “Purchase Order”, “Items Needed”, “The Amount” and the “Unit of Measurement” for each material, “Comments about the Purchase” and the “Total Cost” which should be filled in by the responsible manager or agent.

Save
New
Delete
Save & Close
Close
Form Parameters



Aria Arvand Coating Co.

Raw Material Purchase order NO*
Value

Name of the Responsible Person*
Single Line Text

Unit*
Single Line Text

Raw Material Purchase Order Details
Manager Decision

Date*
Date

Item*
--Select--

Reason for Purchasing*
Multi Line Text

Total Cost
Decimal

Amount*
--Select--

Enter Number*
Number

AnticipatedCost
View: All
Search In
Label: --Select--

New
Delete
Refresh

✓	Line Number*	Item	Cost
✓			
✓			
✓			
✓			

Figure 3. 1 : “Web From” designed for “Raw Material Purchase Order” Application/Source: Cordys Process Factory

Raw Material Purchase Order Details		Manager Decision
Manager	Single Line Text	
Decision	--Select--	
Comments	Multi Line Text	

Figure 3. 2 : “Grid View” of the “Manager Decision Tab” created by Cordys/ Source: Cordys Process Factory

Creating login Credentials for authorization

Whenever a form is built and used for information gathering, e.g. for requesting a purchase order, we need to define an account to check the order and also to be able to modify items requested and to add comments if needed. This process starts with setting up “Organization Data”. Having access to “Administration Dashboard” is required here. We do not enter this field in details in this study.

3.1.2 Building associated “Business Process”

A “Business Process” is built for the “Raw Material Purchase Request” from the modification menu for each application. A “Start Event” shows where the process starts. The “Start Event” can be modified to be triggered in certain conditions. The available conditions are “Insert”-a “Raw Material Purchase Request” is submitted and it triggers the business process-,”Update”-a ”Raw Material Purchase Request” is

modified-and “Delete” which triggers the business process because a “Raw Material Purchase Request” is deleted. For the first steps we select “Insert” for the “Start Event”.

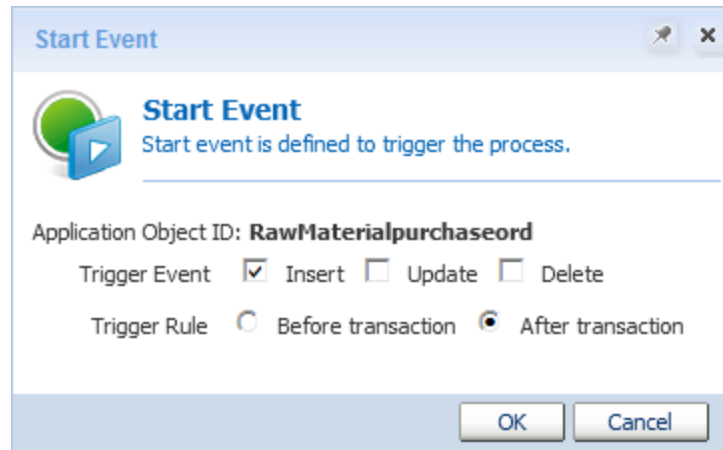


Figure 3. 3 : Modifying how the “Start Event” is being “Triggered” /Source: Cordys Process Factory

A task would be assigned to the responsible manager in the next step to check on the purchase request and approve or reject it. In the “Assign Task to User” configuration box, the associated subject would be connected to the “RawMaterialPurchaseOrderNO” object. In the “Send To” drop-down menu, the “Authorized person for a Group” would be selected and in the group identification options a specified group in the field of “RawMaterialPurchaseOrderApproval. Manager” should be selected. This shows how the manager from the specified group of users is selected to do the task. The role also should be selected as “Manager”.

Assign Task to User

A task will be assigned to a group role, function, direct manager, or specific user as per the option selected.

Activity Name*

Subject

Message

Send Send a web form or a mobile form or both of them as a task.

Form Name Mobile Form Name

Send To

Group Identification

Options

Field Name

Role and Function in the Group

Role*

Function

Proceed to next step on task completion by ☒ All Users ☐ Any One User

☐ Send Task to Personal Email

☐ Add to Favorites

* Required

Figure 3. 4 : “Raw Material Purchase Approval by Manager” task configuration box /Source: Cordys Process factory

In the next section, a “Decision” notation would be chosen to demonstrate the different outcomes of the manager’s decision. Two outcomes are being considered:

1. The first is “Approval” decision which is leading to a “Notification to User” annotation. In the configuration box of the “Notification to User”, the “Subject” is the “Raw Material Purchase Order NO” and the related object for user identification is “Name of the responsible person”. To

define a “condition”, which shows the required condition for the manager to approve the purchase request, a “Connector with Breakpoints” is used. In the configuration box of the connector, it is simply possible to consider the “ManagerDecision” object to be equal to “Approved” object. This procedure is shown in the picture.

Notification to User

A notification will be sent to a group role, function, direct manager, or specific user as per the option selected.

Activity Name* Notify user of the Request Approval

Subject* Raw Material Purchase Rquest Approved[RawMaterialpurchaseorderapproval.RawMaterial

Notification

Send To User name specified in a field

User Identification

Field Name [RawMaterialpurchaseorderapproval.NameoftheResponsiblePerson]

Provide value for Field Name

☐ Send Notification to Personal Email

☐ Send Form Link

☐ Add to Favorites

* Required

OK Cancel

Figure 3. 5 : “Notify user of the Request Approval” configuration box /Source: Cordys Process Factory

2. For the second outcome of the manager decision, which is the purchase request denial or “Reject”, we will do the same steps again. A “Notification to User” is created. Next, the subject in the configuration box is set to be “Raw Material Purchase Order No”. Again, we use a “Connector with Breakpoints” to set a condition for the rejection of the request. We consider “ManagerDecision” object to be equal to “Rejected” object.

Notification to User

A notification will be sent to a group role, function, direct manager, or specific user as per the option selected.

Activity Name* Notify user of the Request Rejection

Subject* [RawMaterialpurchaseorderapproval.RawMaterialPurchaseorderNO]Raw Material Purchase

Notification The Raw Material Purchase request has been rejected.Please contact the manager

Send To User name specified in a field

User Identification

Field Name [RawMaterialpurchaseorderapproval.NameoftheResponsiblePerson]

☐ Send Notification to Personal Email

☐ Send Form Link

☐ Add to Favorites

* Required

OK Cancel

Figure 3. 6 : “Notify user of the Request Rejection” Configuration box/ Source: Cordys Process Factory

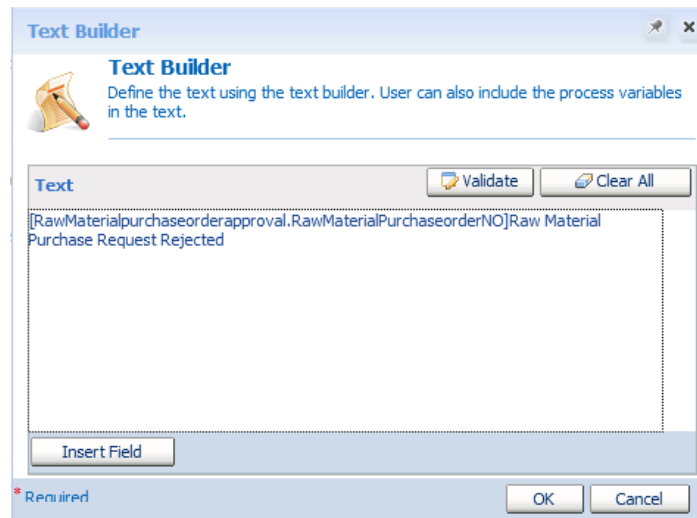


Figure 3. 7 : Application object identifier in “Notification to user” configuration box /Source: Cordys Process Factory

The final step is to set an “End Event”, which is by default a “Message Output”, and we use two “Connector with Breakpoints” to connect two outcomes of the manager decision to the “End Event”

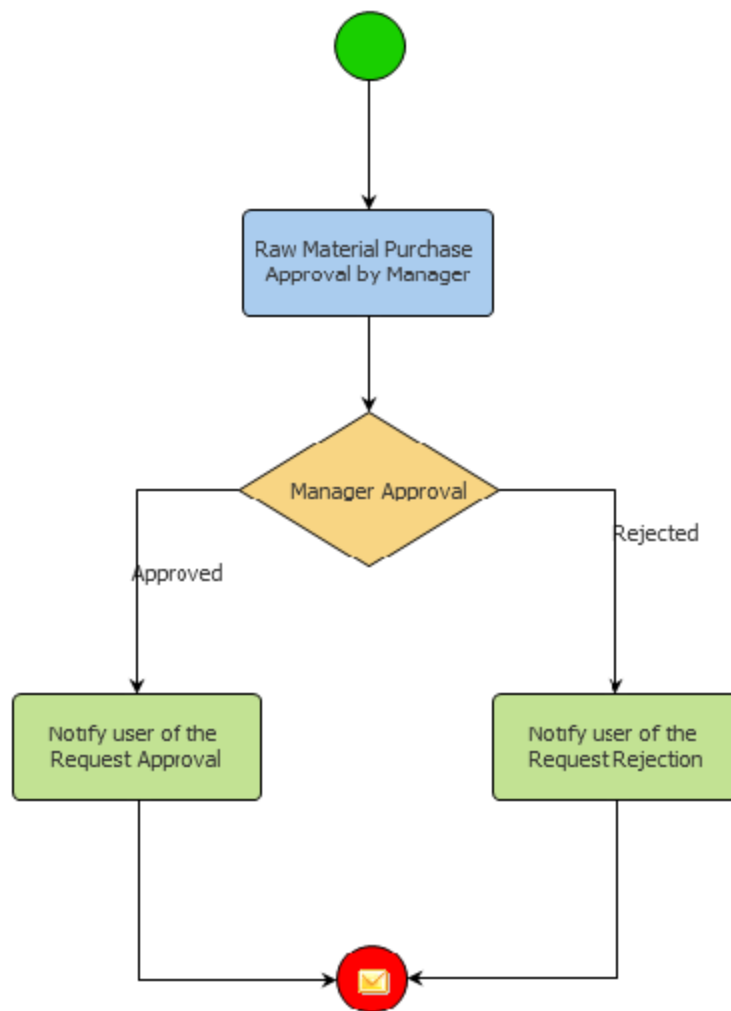


Figure 3. 8 : Schematic of the final business process /Source: Cordys Process Factory

3.1.3 Building related “Business Rules”

In every organization, it is highly recommended to consider the feasibility of each and every operation related to production, sales, service and social relations and the related costs. In order to monitor the cost-effectiveness of purchase request for goods and raw material in our company, it is necessary to define “Business Rules”. “Business Rules” are a set of dos and don’ts in business context, which asks for hierarchical permissions and prevents the unnecessary costs of operation.

A simple “Business Rule” for our company is to ask for a detailed reason for each “Raw Material Purchase Request”. This detailed reason can even be a report of last 6 month purchases and an adaptation of that requests with sales so it is evident that stocks is low and a purchase order is necessary.

We start to implement this “Business Rule” by defining an expression. If the user who is filling the form of “Raw Material Purchase Request”, does not fill the field “Reason for Purchasing”, which asks for details of where the raw material is going to be used, the system automatically goes into the “Abort transaction message” phase and asks for detailed information about the purchase.

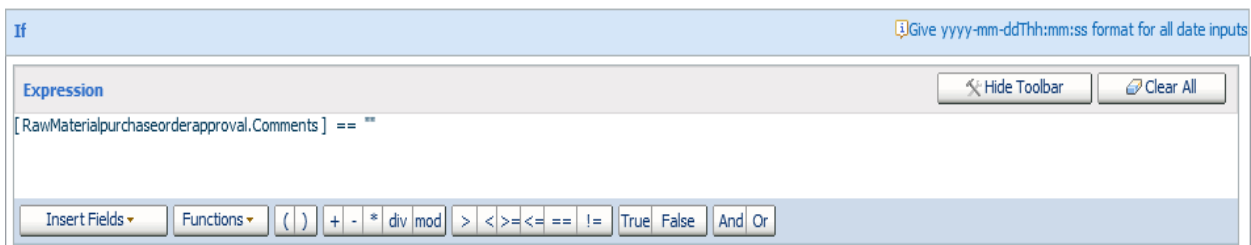


Figure 3. 9 : “IF Expression” in Business Rule /Source:Cordys Process Factory

It is also possible to follow a second approach. Which deliberates the expression entered by user and if it was not satisfactory, the system goes not into phase 1, but to phase 2 which sends the information to the manager for further investigation and puts the request on hold.

Then

Abort Transaction Message

Hide Toolbar
Delete
Clear All

Provide a reason for your purchase request

Insert Fields ▼

Figure 3. 10 : “Then Expression” and aborting transaction /Source: Cordys Process factory

A “Trigger Event” here again is available to start the effectiveness of the “Business Rule” e.g. from the time a request is submitted or it is modified or deleted.

3.2 Developing an Application for Financial Accounting Affairs

After the “Raw Material Purchase Order” is approved by the manager and sent to the provider, the provider sends an invoice in which the amount needed and the price is recorded and the conditions of the purchase is also mentioned. The conditions of the purchase may include the method of payment and the method of delivery.

Here we start to develop a new application for coordinating accounting affairs related to transactions which purchasing raw material and sales to customers cause. When a “Raw Material Purchase Request is sent to the provider, a report from production unit is sent to financial department, regarding anticipated costs and goods ordered. Then the provider also sends an invoice determining the price for ordered goods. The financial department then updates the accounts payable of the company and debits provider’s account regarding the price mentioned in the invoice.

The procedure for updating company customers’ account is similar. Whenever sales manager sends the sales report to financial department, customers account and/or “Accounts Receivable” is updated. At the time the revenue is added to company’s accounts and goods are delivered at customer site, the accounts are balanced.

We start by developing a “Web Form” for this new application. Then we implement the “Business Process” associated with the “Form” and finally we will develop the related “Business Rule”.

3.2.1 Building the Form

The form related to accounting information is called “Accounting Affairs”. Every new form to gather information may contain information of customers or suppliers account.

If a sales receipt has been received, the sales department is responsible to fill the form with sales information and send it to “Accounting Unit”. Whenever a receipt indicating a purchase of a service or raw material is received, it again acts as a trigger event and sends the filled form with the details about the purchase to the accounting department.

To identify each new form received, each form contains an “Auto Number” field. We define this “Auto Number” field as the “Record ID”. A new “Record ID” is automatically created by platform after filling the form. This unique ID is used to distinguish different information received from sales or suppliers receipt for further use. The “Record ID” field has a template and starts from a predetermined template ABC001.

We use “Single Line Text” field type for entering customer or supplier information. “Single Line Text” field type is a simple place to enter “customer or supplier ID” which has been given to each customer or supplier.

For customer or supplier name we use “Multiple Text Line” field which provides a wider space for long or multipart strings of characters. Both “Customer and Supplier Name” and “Customer or Supplier ID” fields are set to be required fields. This means entering Name and ID of the customers or suppliers is necessary or otherwise the system prohibits the form to be completed and it will warn the user about the problem.

In order to define if the form to be filled is related to customers’ accounts or suppliers’ accounts, we use “Select Box” field type.





<input type="button" value="Save"/> <input type="button" value="New"/> <input type="button" value="Delete"/> <input type="button" value="Save & Close"/> <input type="button" value="Close"/> <input type="button" value="Form Parameters"/>		
		
Record ID* Value		
Record Date Date 	Customer or Supplier Name* Multi Line Text	Customer or Supplier ID* Multi Line Text
Type of record* --Select-- 	Unit* --Select-- 	Value of the deal* Number
Details Multi Line Text		Remaining from previous deals Number
Price* Currency		Total to be payed Number
<input type="button" value="Submit"/>		

Figure 3. 11 :”Web Form” for Accounting Affairs application /Source: Cordys Process Factory

3.2.2 Building the Business Process

As usual, we start by the “Start Event” and we connect it to a specific “Decision Event” point where the responsible user or manager at the Financial Department figures out if the received form is related to “Sales” or “Supply Chain”. At this point in the configuration box of the “Sales or Supply Chain” decision event, we define two expressions or conditions. We set the object “Type of Record” in the “Accounting Affairs” application to be equal to “Checked” and also to be equal to “Sales”:

[Accountingaffairs.TypeofRecord]==”1”==Sales

Decision

A Decision box will help in branching out the process based on various conditions.

Name* Sales or Supply chain?

Description

Conditions

Connector Name Record of Supply chain Action Check Supplier Name and ID

Condition Expression [Accountingaffairs.TypeofRecord] == "1" == SupplyOrder

Connector Name Record of Sales Action Checking customers name and ID

Condition Expression [Accountingaffairs.TypeofRecord] == "1" == Sales

Default Action

Connector Name Action

Default action to be performed if none of the conditions are satisfied.

To define decision conditions, add connectors to the decision box.

OK Cancel


Figure 3. 12 : “Sales or Supply Chain” Decision Event configuration box and condition expression /Source: Cordys Process factory

This means the specified user in a group, which here is “Sales Management” group, has checked the group box “Type of record” to be “Sales”. This condition expression leads the process to select the path “Record of Sales” and in the next step, it goes to the “Assign Task to User” event. We assign the task of “Checking customer name and ID” to the specified user.

In the configuration box of this task assignment activity and in the “Subject” field, we enter:

“Accounting department checks if there is a previous record of the customer”


Assign Task to User




Assign Task to User

A task will be assigned to a group role, function, direct manager, or specific user as per the option selected.

Activity Name*



Subject


Message


Send


Form

Send a web form or a mobile form or both of them as a task.

Form Name

Mobile Form Name


Send To


Authorized person for a Group




Group Identification


Options


Group



Group Name*


Role and Function in the Group

Role*


Function


Proceed to next step on task completion by

☒ All Users
☐ Any One User

☐ Send Task to Personal Email

☐ Add to Favorites

* Required

Figure 3. 13 : “Checking Customer Name and ID” task assignment –Group Identification-Role and Function in the Group/Source: Cordys Process Factory

And we also tag the object “Accountingaffairs.RecordID” on this expression. In the configuration box, it is also defined that the task is assigned to the user by a “Web Form”. In the “Group Identification Tab”,

after selecting “Authorized person for a group”, which identifies certain user/users to do the task, a special group will be selected which typically we call this group “University of Hasselt”. Finally we select the role and function of the user. For the Role, we select Manager or a “Role Tester” and we leave “The function” blank.

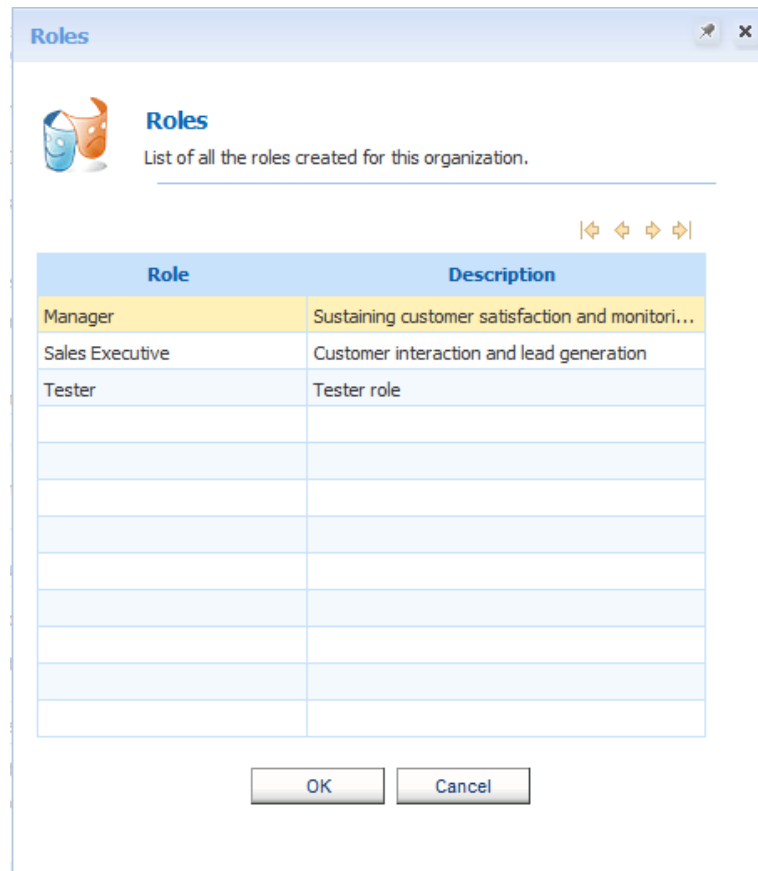


Figure 3. 14 : The predefined “List of Roles” in the task configuration box /Source: Cordys Process factory

In order to connect the “Sales or Supply chain” decision event to “Checking customers name and ID” task assignment activity, we use a “Connector with Breakpoints” .This connector is also configurable, both in shape and in context. In the configuration box of the connector, which we call it “Record of Sales”, the condition expression is defined as:

[Accountingaffairs.TypeofRecord]=”1”=”Sales”

Condition

Connector
Define the decision conditions using the visual expression builder. If the condition is true, then the process can branch to another element in the process diagram..

Connector Name* Record of Sales

Action Checking customers name and ID

☐ Set this as a Default action if none of the conditions are satisfied.

Condition Expression Validate Clear All

[Accountingaffairs.TypeofRecord] == "1" == Sales

Insert Field () > < >= <= == True False And Or !=

* Required OK Cancel

Figure 3. 15 : “Record of Sales” connector with breakpoints configuration box /Source: Cordys Process Factory

This identifies the “Sales” path of decision point. We go further in this path and we reach another decision point. Accounting department then examines the field “Customer or Name” and “Customer or Supplier ID” to find out if there is a record of these fields or in another words they try to find the matching ID and Name and related fiscal accounts.

Now, there is a need for another “Decision Point” event. If there is a previous record of the name and ID, the process chooses the path “Known” and goes to another phase which is another “Task Assignment to user”. In this activity the responsible person or “Manager” updates the customer or supplier account information according to amount of transactions and the financial data recorded in the form. The contents of the configuration box will be discussed later.

If there is no evidence of a previous deal or contract between the company and the customer or supplier or in another words there is no evidence of aforementioned ID and Name in the database, the other path, ”New” will be selected.

In the configuration box of related "New or Known customer" decision event there are two condition expressions related to two paths:

[Accountingaffairs.CustomerorsupplierName]andor[Accountingaffairs.CustomerorsupplierID]==TRUE()

Decision
A Decision box will help in branching out the process based on various conditions.

Name*

Description

Conditions

Connector Name	Action	Condition Expression	Edit	Validate
<input type="text" value="Known"/>	<input type="text" value="Update Customer Account Info"/>	<input type="text" value="[Accountingaffairs.CustomerorSupplierName]andor[Accountingaffairs.CustomerorSupplierID]==true()"/>	<input type="button" value="Edit"/>	<input type="button" value="Validate"/>
<input type="text" value="New"/>	<input type="text" value="Create customer profile"/>	<input type="text" value="[Accountingaffairs.CustomerorSupplierName]andor[Accountingaffairs.CustomerorSupplierID]==false()"/>	<input type="button" value="Edit"/>	<input type="button" value="Validate"/>

Default Action

Connector Name	Action
<input type="text"/>	<input type="text"/>

☐ Default action to be performed if none of the conditions are satisfied.

☐ To define decision conditions, add connectors to the decision box.

Figure 3. 16 : "New or Known Customer" decision point configuration box /Source: Cordys Process Factory


Whenever a customer or a supplier Name and/or customer or supplier ID is true, which means there is a record of previous business relationship, the “Known” path will be chosen. Otherwise the “New” path is being selected.

After the selection of “New” path, another “Assign task to user” activity is created and during this task a new “Customer Profile” is created by the responsible user. This user gathers full details of the customer information from sales or production unit along with the financial data of the record and creates a customer profile. This data is usually gathered by a “Registration Form” filled by the customer /supplier at the initial phase of the cooperation.

After creating the customer profile, a “Send Message” event is used to send a message to another user from financial unit. This is a simple message just to inform financial department about the new “Profile”. This message activates a new “Assign task to user” event which is called “Update customer account info”. This task is the final destination of both “Known” or “New” paths originated from the “New or Known customer” decision event.

Just to inform the customer of an update in their account according to latest deals and transactions, we use a “Notification to External User” event from the “Activity Library”. This green activity send a notification to an email specified in the fields “Customer or Supplier Name” or “Customer or Supplier ID”. A short message is defined to be sent to the user which is modifiable and can contain information about the amount and type of transaction.

Notification to External User



Notification to External User

A notification will be sent to an external user.

Activity Name*
Inform Customer about account balance

Subject
Inform Customer about account balance

Notification
Dear Customer;
Your account balance has been updated according to latest transactions

Send To
Email address specified in a field

Field Name*
[Accountingaffairs.CustomerorSupplierID]

Email Settings

From Email
Display Name

☒ Template Name
☐ Template Type

External Notification
Map Inputs

☐ Cc
☐ Bcc

☐ Send Form Link
☐ Add to Favorites

In case of multiple addresses, separate each email by a semicolon.
OK
Cancel

Figure 3. 17 : “Inform Customer about account balance” Notification to user configuration box /Source: Cordys Process Factory

Now we get back to the second path starting from “Sales or Supply chain decision event, which is the same as the previous path in shape, but different in process configuration. The path reaches the “Check supplier Name and ID” task assignment and then to the “New or Known supplier” Decision point. Again a “Known” path and “New” path is designed respectively for “Update supplier account info” and “Create

supplier profile” task assignments to users. And finally a “Notification to External user” is sent which we call it “Inform Supplier about account update”. Both of the paths reach an “End Event” which is simply a “Message” recorded in financial department database.

Condition

Connector
Define the decision conditions using the visual expression builder. If the condition is true, then the process can branch to another element in the process diagram..

Connector Name* Record of Supply chain

Action Check Supplier Name and ID

☐ Set this as a Default action if none of the conditions are satisfied.

Condition Expression [Validate] [Clear All]

[Accountingaffairs.TypeofRecord] == "1" == SupplyOrder

[Insert Field] [()] [>] [<] [>=] [<=] [==] [True] [False] [And] [Or] [!=]

* Required [OK] [Cancel]

Figure 3. 18 : “Record of Supply Chain” connector with breakpoints configuration box /Source: Cordys Process Factory

We then get back to the start point of the business process. At times it is possible for the financial department to receive a financial statement regarding a completion of payment from a customer of a supplier. So at the beginning of the process we create a new path starting from the first decision Point called “Actual AP/AR or sales/SC?”

The upper path reaches the two previous braches which explain the sales or supply chain activities and the other one goes to a “While Loop”. We call the later path “AP/AR felt”. AP and AR respectively point to “Accounts Payable” and “Accounts Receivable”. A “While Loop” is a constraint defining the conditions of satisfaction for a payment to be recorded. This “While Loop” is called “While there is still AP/AR” which points to the fact that until a customer or a supplier needs to pay part of the payables or they need to

be paid part of their receivables, the platform waits and does not send a notification to them. In the configuration box of this loop, and in the “Loop Condition expression” we enter:

[Accountingaffairs.Totaltobepaid]!=0

Process Loop - While

A While Loop represents a set of activities that should be executed repeatedly while the condition specified is true.

Loop Name* While there is still AP/AR

Description While the supplier or customer has to pay/need to be payed, calculate the remaining amount but do not send notification

Loop Condition

Expression [Accountingaffairs.Totaltobepaid]!=0

Validate Clear All


Insert Field () > < >= <= == True False And Or !=

* Required OK Cancel

Figure 3. 19 : “While there is still AP/AR” Loop configuration box and the loop condition /Source:Cordys Process Factory

This means until the total amount to be paid by the company or by the customer is not equal to zero, the system needs to wait. When the loop condition is satisfied, the process finally reaches its final destination which is an “Assign task to user”. According to this task “Set off AP/AR” users update the customer or supplier account information and finally send a notification to them about the account balance update using “Notification to External user” event. The process is then terminated.

Assign Task to User



Assign Task to User

A task will be assigned to a group role, function, direct manager, or specific user as per the option selected.

Activity Name*
Set off AP or AR

Subject
Set off asset or liability which has been recorded in customer/supplier profile[Accountingaf

Message

Send
Form
Send a web form or a mobile form or both of them as a task.

Form Name
Accounting affairs
Mobile Form Name

Send To
User

User Identification

User Name

User List

Proceed to next step on task completion by
☒ All Users
☐ Any One User

☐ Send Task to Personal Email
☐ Add to Favorites

Configure

* Required

OK

Cancel

Figure 3. 20 : “Set off AP/AR” task configuration box /Source: Cordys Process Factory

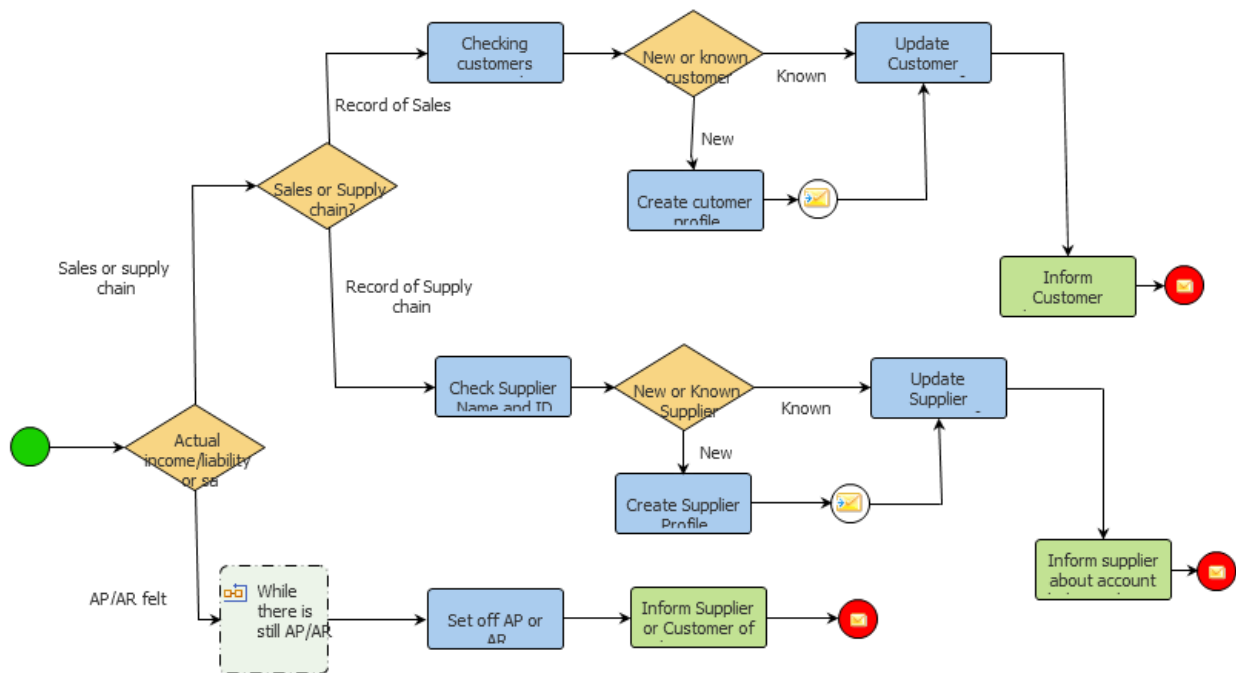


Figure 3. 21 : Schematic of the whole business process for Accounting Affairs application /Source: Cordys Process Factory

3.2.3 Building a Schedule

In real business world and in organizations it is common to organize events or plans to start on a predefined data and time. These events activate a process or transaction. The procedure of setting these events is called “Building a Schedule”.

In Cordys, designing a schedule is simple by using “Schedule Wizard”. We select “Build Schedules” from the main menu in “Accounting Affairs” and select “New Schedule”. It is important to mention that there are 3 main features in each schedule.

1. Schedule details: determine name, description, type of schedule, time zone and related subjects.
2. Schedule target: The target of the schedule specifies the activity and configuration of it which the schedule triggers.

3. Schedule target inputs: provide the inputs which trigger the target event.

In the first step it is needed to define the “Recur Event” which determines the date and time of the event(s). In this step it is possible to define the number of times which a “Recur Event” can be executed and the length of it.

Provide Scheduling Details.

Schedule Name * Management Report

Description Management Report is created every month

Schedule * Monthly ☐ Auto Deploy

Time Zone * EET,CAT,WAT (GMT+02:00)

Recur Event - Every month on*

Date	Hour	Minute
1	10	10

Give all the time values as per 24 hour clock standards

Schedule Counter * 1 To run infinitely, give count as '-1'

Figure 3. 22 : “Schedule details” and “Recur Event Settings” /Source: Cordys Process Factory

In the next step we need to modify the target events. The target can be a “Process”, a “Web Service” or a “Report”. The final step contains what should be mentioned on the schedule. For example when a “Report” is scheduled to be created on a date, a “Message”, a “Writer” and a “Date” should be mentioned.

Provide Target Properties.

Process Web service Report

Trigger any process on schedule by providing relevant inputs

Target Type Business Process

Business Process Name Accounting affairs

Figure 3. 23 : “Schedule Target” configuration /Source: Cordys Process Factory

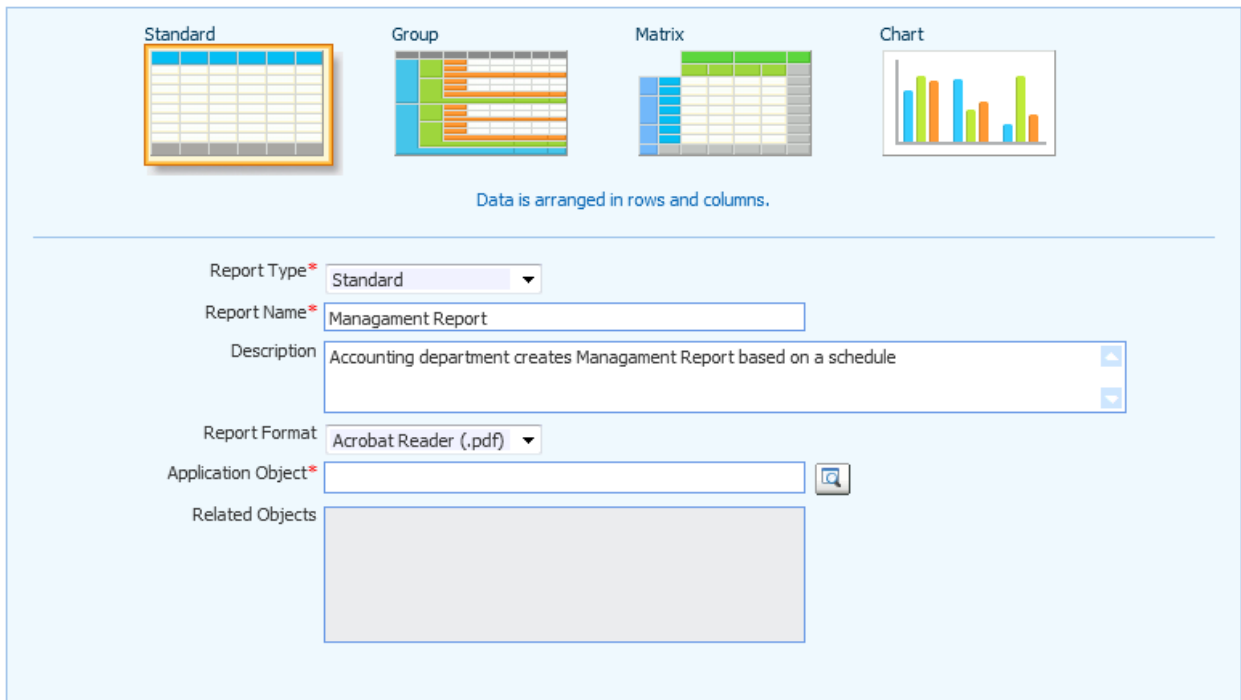
3.2.4 Building a Report

In each company it is necessary to have access to explaining data in a meaningful manner which clarify the business conditions and situations. This template data is a “Report”.

In Cordys, creating a report is done using “Report Wizard”. This wizard builds a report in 6 steps.

1. Defining the report properties: Type of report, Name and description, Report format
2. Report Content: fields needed to be contained in report

3. Summarizing the report fields
4. Setting conditions for filtering data contained in a report
5. Defining report page layout
6. Creating a report summary



Standard Group Matrix Chart


Data is arranged in rows and columns.

Report Type* Standard

Report Name* Management Report

Description Accounting department creates Management Report based on a schedule

Report Format Acrobat Reader (.pdf)

Application Object* 

Related Objects

Figure 3. 24 : Report properties /Source: Cordys Process Factory

It is necessary to mention that building 4 types of report is possible in Cordys:

1. Standard Report
2. Group Report
3. Matrix report
4. Chart Report

3.2.5 Building a Business Rule

As explained before, in every business some rules should be defined as a set of dos and don'ts to guide activities in a clear way.

For “Accounting affairs” application, we define a simple business rule. In “IF” expression, we define this expression:

Until the payment to be made-“Remainingfromthepreviousdeals” object is not equal to zero or:

[Accountingaffairs.Remainingfrompreviousdeals] != 0

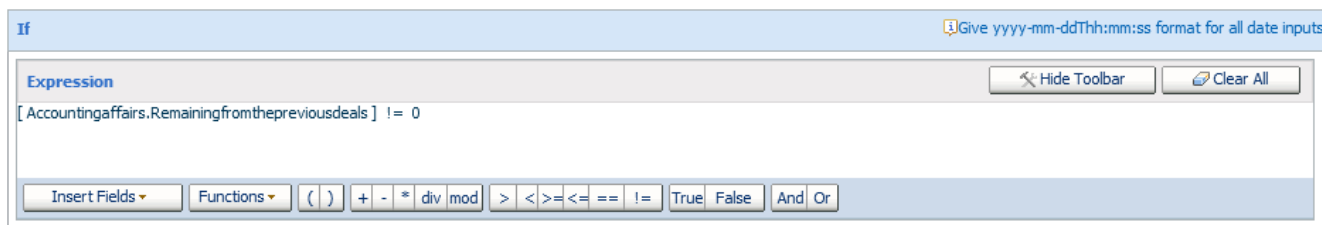


Figure 3. 25 : “IF expression” in the Business Rule /Source: Cordys Process Factory

Then a message should be sent to a user to update account balance. But if that account balance is equal to zero then the message asks the user in Financial Department to set off AP/AR and notify the user about it.

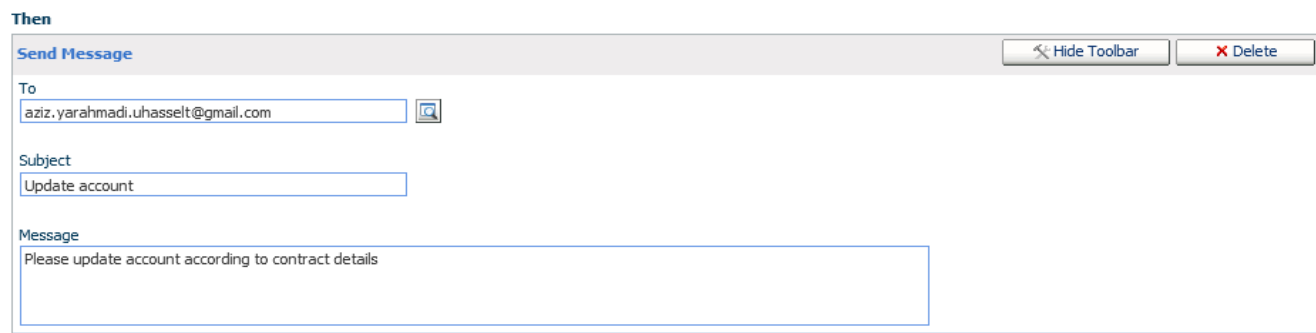


Figure 3. 26 : “THEN Expression” in the Business Rule /Source: Cordys Process Factory

Else

The screenshot shows a 'Send Message' dialog box. The title bar is 'Send Message' with two buttons: 'Hide Toolbar' and 'Delete'. The dialog has three main sections: 'To' with the email address 'aziz.yarahmadi.uhasselt@gmail.com' and a contact icon; 'Subject' with the text 'Account Update'; and 'Message' with the text 'Update account balance, AP/AR has been set off.'. At the bottom, there is an 'Insert Fields' button.

Figure 3. 27 : “ELSE Expression” in Business Rule /Source: Cordys Process Factory

3.2.6 Packing the application

Finally after creating different parts of an application, we pack these parts into one zip file that can be delivered to the customer and the customer will download and share the application.

In this section a “Package Name” would be defined and then packed components which are required for each business type would be gathered together. So we select Objects, Web Forms, Business Processes, Business Rules and any needed web service for our application package and then the packaging is done.

Package Properties		Packed Components	
Package Name * Accounting		Add or Remove Component	
Description Accounting Application		Application Objects Add or Remove Content	
Default Language English(UK)		Accounting affairs	
Additional Languages		Web Forms Add or Remove Content	
Add or Remove		Accounting affairs Accounting affairs List View	
Additional Details		Business Processes Add or Remove Content	
Package Status: In Progress		Accounting Affairs	
Referred Applications		Business Rules Add or Remove Content	
No Referred Application available.		Update accounts	
		External Web Services Add or Remove Content	
		getAllNames insertRecord getAllUsers getUserById	
		Rest Web Services Add or Remove Content	

Figure 3. 28 : Bringing different parts of the application together /Source: Cordys Process factory

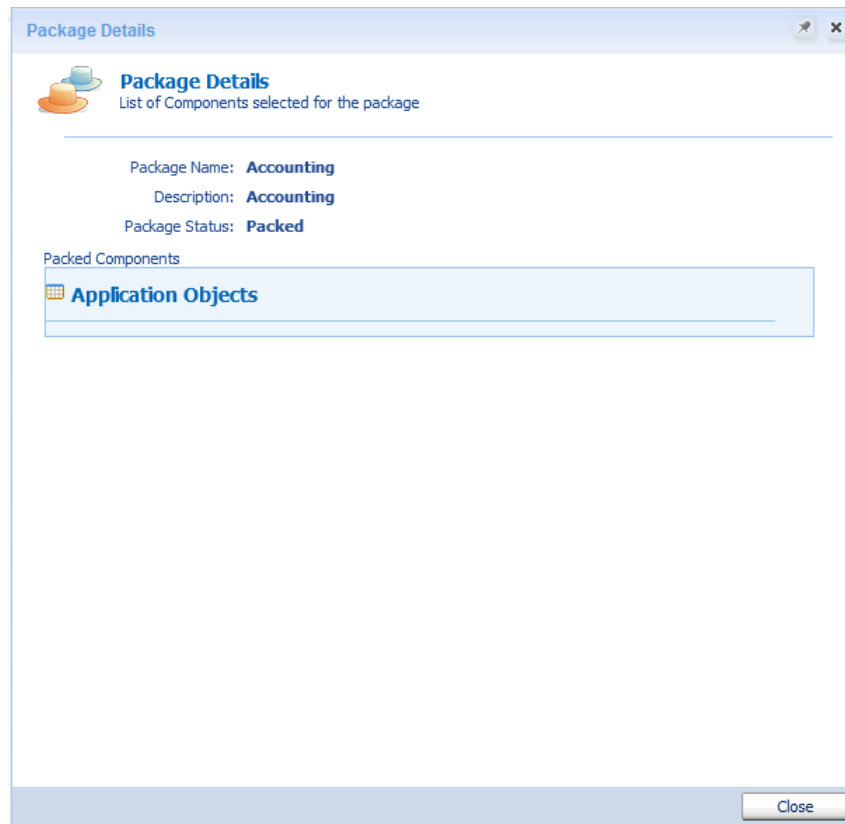


Figure 3. 29 : Application packed and ready to be loaded to customer's machine /Source: Cordys Process Factory

4 Cordys Process Factory influence evaluation

After the development phase of the application and implementing different parts, the relationship and connections between application objects and creating functionalities is clear. In this section, I discuss the results of the evaluation method we presented in the first part of this study. I will visualize the results of applying the evaluation framework which we applied in previous section on Process Factory capabilities in the form of charts. During this phase, short discussions on advantages and concerns of applying cloud business solutions will be presented.

After detailed discussions of applying evaluation criteria from the evaluation framework, which has been designed based on Stefan Koster's framework on business process modelling and management and additional evaluation criteria which I selected based on working with the Mashapps composer, the results can be categorized in a chart.

With this preface, we are now able to cover the measurement of service credibility in Cordys Process Factory. As we discussed before, in methodology section of this research, we try to define criteria in which the similarities between all business solution providers can be evaluated and rankings according to support for operations can be created. Selecting criteria for assessing Cordys Process Factory platform follows the same methodology. Business process modelling and management suite performance needs to be assessed by some special metrics. The evaluation of business process management, can be viewed from 3 dimensions: Rationale, Structure and Quality (Filipowska et al.2009).

Rationale dimension tries to prove the applicability and rationale for the measurement approach. In another words, it both checks the motivation for assessment and the usability of methodology which has been chosen. Structure dimension tries to prove the adjustability of methodology with the purpose in which the methodology has been used. This dimension tests the coordination of methodology with potentials and weaknesses from a business user's point of view. Finally the Quality dimension tests the correctness and the degree of recognition of the evaluation approach. We need to consider all three dimensions in order to prepare highly detailed perspective for the evaluation criteria.

Each business process modelling platform needs to be able to integrate its services with business needs of the organization in different levels of business. With a top-down view, first it should be able to handle

strategy implementation and deployment. On the next level, the evaluation tests the existence of mechanisms in knowledge discovery and associated techniques. Sequentially, support for modelling, design, deployment and operations development needs to be assessed using the framework. There are also micro-level support criteria which needs to be assessed. We need to check whether the business process modelling suite supports the interaction with different systems and operating systems. A BMP platform ability to handle failure is another issue which needs to be tested. The business users must be informed in case of errors in flow of data or miscalculation in the execution of tasks and activities. Also, it is needed to mention that whenever business developers design and implement business processes, according to new data and business environment, like change in partnerships, technologies and infrastructure, new versions of business process model may be needed. Business process modelling suit therefore, must be able to handle change in business processes.

Selecting criteria for evaluating Cordys Process Factory platform is based on the methodology which has been introduced at the beginning of this study. In this research, I apply appraisal criteria for business process modelling suite selected from 4 perspectives. Modeling criteria, Design criteria, Interaction criteria and Monitoring and control criteria (Koster, 2009).

Modelling criteria deals with the flexibility of modelling tools in the field of support for business processes which can be of different levels, modelling business rules and the ability to model key-performance indicators (KPIs). Key-performance indicators, sometimes called key success indicators (KSIs), according to definition, are responsible to measure the efficient and deficit performance factors during moving toward corporate goals. Organizations define these factors (measures) to assess the approach toward achieving what they have planned before in their macro-strategies. According to Koster, I determine different factors in this context. In the field of business process modelling, the ability to model business processes and business rules from different perspectives, support for different business process modelling languages, support for interoperability between different business process modelling languages, the capability to design a business process using a business rule, support for extracting a business rule from a business process and support for KPIs form evaluation criteria.

Modelling criteria	Evaluation result
Support for Business Process Modelling	
I. Support for different business process modelling languages	Business process modelling notation (BMPN)-As in accounting affairs business process model
II. Support for interoperability between different business process modelling languages	No
III. Support for interoperability between simple process modelling methods and business process modelling languages	Limited-importing from ARIS in functional view
IV. Support for different views when modelling a business process	Yes-Functional view and Behavioral view according to Koster (2009)
V. Support for different perspectives of a business process	No
VI. Support for modelling with implicit business rules	Yes-By designing application objects for the rule-As in the "Payment rule" in accounting affairs application
VII. Support for modelling with explicit business rules	Yes-By extracting associated objects-As in extraction of the objects of accounting affairs from objects directory
VIII. Support for modelling business processes using explicit business rules	Yes-By extracting associated objects
IX. Ease of use of defining explicit business rules.	Forming a business rule using object for each entity of the rule-As in "Payment rule"
Support for KPIs.	Yes-Using codes and application objects

Figure 4.1: Evaluation results of modelling criteria

Design criteria examines the potentials in designing real business process models which visualize the flow of data, the execution of tasks and the performance of roles. This criteria also looks for the ability to design well-defined user interfaces which facilitate the interaction with users. User interaction is based on determination of user activity and defining access privileges for users. Therefore, managing user activity needs to be assessed. Selecting evaluation criteria here consists of 4 major issues: support for creating executable business process models, support for various programming languages for implementing services or applications, support for designing a user interface, and support for user management. The first criteria looks for different business process execution languages, the capability to translate business process modelling to business process execution languages and vice versa (manual or automatic) and the capability to link business process execution model with business process model. Support for designing user interfaces includes support for separate applications for data entry, support for portal technology and support for an activity list. Support for user management includes examining the method of describing roles, support for determining user capabilities based on organizational role, support for importing organizational structure from other systems, support for determining user capabilities based on tokens, support for manually assigning a user to a role, support for automatically assigning a user to a role based on his capabilities and support for activity permissions based on roles.

Design criteria	Evaluation results
Support for creating executable business process models	
I. Supported business process execution languages	BMPL-According to Koster (2009)
II. Support for manual translation between business process modelling languages and business process execution languages	No
III. Support for automatic translation between business process modelling languages and business process execution languages	No
IV. Support for linking the business process execution model with business process model	BMPL code is generated after business process modelling phase is over
Supported programming languages for implementing services/applications	JAVA/XML but still no APIs for development is available
Support for designing user interfaces	
I. Support for separate applications for data entry	Yes-As in Both applications created in case study
II. Support for portal technology	Both integration with portals and self presentation of services-As in packing the application for self presentation or integration with Google apps
III. Support for an activity list	Yes-Created from main menu
Support for user management	
I. Way of describing roles (by names/description or by capabilities)	Full detail-Name/Role/Description of activities
II. Support for determining user capabilities based on organizational role	Both organizationally or by user definition-As in definition of roles based on associated application objects
III. Support for importing organizational structure from other systems	No
IV. Support for determining user capabilities based on tokens (certain capabilities of a user to execute certain functions, procedures or activities)	Yes-roles and activities are connected using application objects
V. Support for manually assigning a user to a role	Yes-As in assigning the "credibility check" to "Accounting department employee" role
VI. Support for automatically assigning a user to a role based on his capabilities	No
VII. Support for activity permissions based on roles	Yes-by linking roles to permissions using administration tools

Figure 4.2: Evaluation results of design criteria

Interaction criteria concentrates on evaluating the way information from events and processes is sent and received. The way a responsible person is informed of happenings need to be valued and assessed. Selection criteria within support for informing the user includes support for active informing and support for passive informing.

Interaction criteria	Evaluation results
Support for informing the user	
I. Support for active informing	Yes-by notifications, warning and error messages
II. Support for passive informing	Yes-by emails-As in "Accounting Affairs" application

Figure 4.3: Evaluation results of Interaction criteria

Finally, Monitoring and control criteria, includes checking over technical monitoring which controls the availability of service and service maintenance from a technical point of view, support for monitoring business operations and the ability to deal with change management in business concept. Evaluation criteria in this context includes support for technical monitoring and control, support for business monitoring and support for business control. Support for business monitoring includes support for active and passive monitoring, support for multiple levels of detail and support for different views of monitoring information. Support for business control also includes support for process instance evolution, support for changing business rules, support for changing activities and support for changing the workload balance between users.

Monitoring and control criteria	Evaluation results
Support for technical monitoring and control	Yes-flow of data is controlled-As in trigger event
Support for business monitoring	
I. Support for active monitoring	Yes-after initiation of process, role, etc.
II. Support for passive monitoring	Yes-using messages
III. Support for various level of detail	Yes-As in using "notes" in business processes
IV. Support for different views of monitoring information	Service view-Process view-Overall view-According to Koster (2009)
Support for business control	
I. Support for process instance evolution	Yes-new process instances will change results accordingly-As in changing trigger event in applications
II. Support for changing business rules	Yes-it also changes process instances accordingly-As in changing contents of "Payment rule"
III. Support for changing activities	Yes-As in changing activities in "Accounting Affairs" business process
IV. Support for changing the workload balance between users	Yes-It may change roles and activity's logic

Figure 4.4: Evaluation results of monitoring and control criteria

In this research, I followed Koster's framework and also I will add measurement criteria for other functionalities of Cordys Process Factory. Koster's framework concentrates only on business process management package of the platform. Cordys Process Factory has other services too. This platform operates on a cloud communication infrastructure. So one of the most important evaluation criteria is the availability and the degree of reliability of service. In this criteria we assess if Cordys is ready to provide different pricing plans. Besides that, we need to evaluate the hierarchical architecture of Cordys Process Factory in designing an application. This platform, builds services based on detailed entities, application objects. Then each service in an application, like schedules, reports and forms are formed based on the coordination of application objects. So it is needed to evaluate the performance of this type of architecture. In this criteria, coordination and compatibility of objects, quick access to objects during any part of development phase and multi-level support for complicated application will be assessed.

Credibility and performance of Process Factory services will also be assessed. In this context, time needed to develop each of the three tools, availability of each any time, support for change in business environment, degree of compatibility with other solution providing platforms and level of integrity with organizational systems like Google and Yahoo mail or calendar will be assessed.

Another assessment criteria, concentrates on the features which Cordys Process Factory has provided to design other parts of an application. Forms, reports and schedules. The need for knowledge of programming languages, user interaction, degree of being user friendly and user control over change management will be assessed during the evaluation of user management.

Finally, we evaluate the performance of web services, which act as the backbone of data transaction feature in a cloud platform like Process Factory. The availability of service and support for different types of data are selection criteria elements.

“Cordys Process Factory” consists of multiple tools which facilitate decision making procedure by providing certainty in a changing business environment. First of all, by providing “Business Reports”, it helps to achieve real time data in a meaningful manner to managers and policy makers. Now it is possible to control over used raw material, check on stock on warehouse and the procedure of loading and preserving the ultimate products using reports. These reports are available to be created from every unit of business and credentials to provide reports would be granted from “Cordys Process Factory”. Reports also take care of different types of data and can handle charts, graphs and tables of financial information. Reports also are able to compare results to predetermined production and financial plans and in this way help managers improve their ideas through developing business plans.

In real business world, scalability of services is a very important factor of satisfaction in choosing software as a service (SaaS) platforms. “Cordys Process Factory” facilitates this functionality in several ways. It includes a library of application objects. In this library, objects of each application, which act as different rooms and tools in house for different purposes, provide different functionalities. Whenever there is a need for a new functionality in business operations, it is simply possible to add related objects to the application. This scalability function also forms in business processes, forms and business rules. Where in business processes, the administrator can add functions, activities, roles and conditions which did not exist before. Also it is so easy to define new access credentials in every level to extend user accessibility in case new people joined the project and new roles will be included in operations.

Credibility and performance of service	Evaluation results
Availability of service	Good-Except for incompatibility with some web browsers
Support for change in business environment	Yes-changing roles, activities, resources, events by changing application objects
Degree of compatibility with other solution providing platforms	No compatibility
Level of integrity with services like Google or Yahoo	High-integrated with Google Apps

Figure 4.5: Evaluation results of credibility and performance of service criteria

Fast delivery of service in “Cordys Process Factory” is of great importance. Developing applications for a company in order to answer for special requirements does not depend on software or hardware anymore. A “Fat Server” helps managing data and applications. One or more “Fat Servers” in “Cordys Process factory” site keep and run codes and deploy the application. In this model of “Client-Server” theory, clients at customer’s site are just provided with a graphical user interface (GUI) and send and receive requests for data processing and information retrieval. On the other hand, “Thin Clients”, in our case the customer’s end user machines, do not require special skill and knowledge to work with. Business users can run processes, build rules, define tasks and provide solutions in a marginally less time. Comparing to other business intelligence (BI) systems, according to “Cordys Process Factory” website, “Mashapps composer”, the application designing platform of “Cordys Process Factory”, is able to compose cloud applications 8 times faster than “Lotus Notes”, “IBM” business collaboration software.

Performance of web services	Evaluation results
Support for different web service implementation languages	XML,WSDL
Availability of web services	High-although it is up to service provider
Support for different types of data	Yes-SMS, Email, Warning messages, etc

Figure 4.6: Evaluation results of performance of web services criteria

Cost reduction is another feature which “Cordys Process factory” services bring. They offer outsourcing all or parts of companies’ business solution functionalities with several pricing strategies. But the most favorable pricing plan for companies, especially small and medium-sized enterprises (SMEs), which are growing rapidly in the economic structure of the European countries and generally all around the world and from the biggest part of revenue in private sector of developing countries, is paying for what they have used. In this way, cost reduction will be optimized and certain services will be improved. Also again according to Cordys website, cost per user will be forced down by 80 percent, which means more financial resources will be available for Research and Development and focusing on performance improvement of other services offered by the company. Also Cordys states that by applying their services 250 servers will be decommissioned and 9000 global applications will be reduced to only 600, which will be a great success.

General business adaptability	Evaluation results
Reliability of service	Highly reliable: security-integrity-availability of data
Service affordability	Free trial and subscription fee

Figure 4.7: Evaluation results of general business adaptability

“Cordys Process Factory” helps operators and employees to work on the go. Cloud structure makes it possible to sync data and application parts on all platforms and even mobile devices. Designers can now

discuss the details of the application on portable devices running every software on all operating systems. This is because of using “Client-Server” architecture and “Thin Clients” which just provide a user interface for the operators and do not keep data or structural operability. Also, creating backups from data and business cases information protects data security in cases of theft, software and hardware malfunctioning and employee performance.

Hierarchical architecture	Evaluation results
Coordination and compatibility of application objects	During all development phases
Quick access to objects during any part of development phase	Yes-From main menu and access to objects directory
Multi-layer support for complicated applications	Yes-Big customer cases like Fujitsu, Siemens and ING

Figure 4.8: Evaluation results of general business adaptability

Restructuring of the organizational structure is easily possible in “Cordys Process Factory”. If a repositioning of the key personnel or employee happens due to a need of a change in capabilities and skills, Cordys can manage this substitution in processes, rules and applications. Access credentials and responsibilities will change accordingly. Also, in cases where there is a need for new skills and management capabilities because of requests from customers, new positions will be defined in the company and respectively, associated definitions of objects, roles, access and rules will be created.

Security and legal issues are two other success factors of “Cordys Process Factory”. Data security and integrity is guaranteed and Cordys takes care of availability and integrity of data at any time. They also do not possess the data and commit on keeping the data using encryption techniques, which protects the confidential data of business patents and knowledge. Comparing to software which require buying multiple licenses and permissions on multiuser functioning and complete services, “Coryds Process Factory” does not require licensing and acquiring one unique permission for a defined number of users is included in the contract and the price to acquire the service is relatively cheaper that legacy systems.

Finally, implementation of business concepts is easier in “Cordys Process Factory”. There is no need for skilled users and developers to prepare thousands lines of codes for an application. Each compartment of an operational business concept will turn into parts of an application. Each part is an easy to understand graphical subset which visualizes its functionality. “Business processes” show the flow of data in day to day operations. “Schedules” and “Reports” visualize plans to start activities and reporting activities which are routine operations of every organization. These small parts are gathered around by dragging and dropping parts and connecting them using logical relations.” Cordys Process Factory” makes it simple to manage concepts. Now there is no need for huge costs of acquiring platforms, maintenance and service. Information is secure, service is reliable and data integrity is guaranteed.

Experience with Forms, Reports and Schedules	Evaluation results
The need for knowledge of programming languages	No-only JAVA for understanding the logic
User Interaction	Full control
Degree of being user friendly	High-some small problems with BMPS tools and saving procedure
Control over change management	Yes-advantages of using bottom-up architecture

Figure 4.9: Evaluation results of experience with forms, reports and schedules criteria

5 Conclusion: Advantages and Concerns of applying cloud business solutions

In this final section, some of the advantages of applying Process Factory and concerns of leaving previous solutions will be discussed shortly. Cordys Process Factory follows an innovative path in providing cloud solutions for ICT obstacles of the companies. Legacy IT systems were not able to react to quick changes in business relationships, policies and transactions. They required more time and resources to perform tasks and they also used older technologies which made them bigger and heavier. New technologies and management skills have created new opportunities for organizing business plans and day-to-day activities.

Cloud computing, which is to provide services using a vast group of computers working together, has established new platforms to facilitate the flow of data in business. As the business environment is unstable and changes due to internal and external factors, decision making relies on real-time reliable data which can be achieved in meaningful manners to managers.

Cloud business solutions, a branch of cloud computing tries to conquer uncertainties, cost saving problems, time and resource allocation requirements and personnel recruitment using SaaS-Software as a Service-, PaaS-Platform as a Service- and IaaS-Infrastructure as a Service. Decision making procedure requires clear plans from the starting event of every business activity until the end point of it. This means time periods, tasks, roles and conditions need to be planned and described. These technical features are provided in the form of reports, schedules, business processes and forms. Cloud solutions provide these tools in a customizable form for different customers. Customers can add or remove different parts of each application designed according to business and management needs. Also various industries require different platforms and facilities. That is why customization affects the opinions of industry leaders about the quality of service in business solutions.

Scalability is another important feature of cloud business solutions. New requirements, like business activities, new user accessibility, new resource allocations and related subjects can now be added to the platform more easily.

Another success factor of new business solutions is the fact that they will be quickly delivered to customers. Delay periods between estimating requirements to software and hardware acquisition and to

design and test phases are proportionally much shorter and services can be delivered in a few minutes. Also this feature makes updating the software quicker and customers will receive updates sooner.

Additionally, unreliable business policies, strategies, economic crisis and economic changing situation, result in changing and unclear requirements which in turn may turn even new solutions into insufficient and weak bottlenecks. Cloud business solutions make it easy and cheap to change prerequisites and can coordinate all solutions according to business needs.

Cloud business solutions are marginally cheap, considering the usefulness of operation they provide and the time and cost saved due to a reduction both in providing infrastructure and personnel who are responsible for providing.

These cheap solutions are proper platforms for low-budget business entities with a few number of staff and limited resources which usually specialize their services and limit them to one or a few fields or requirements or business.

Another important advantage of cloud solutions is the improvement of accessibility. Employees can start a project at office, continue to work on it in partner's organization and finally to prepare custom features at customer's site. Solutions are enabled 24/7. There is no need to move business cases on flash memories and this way security would also be improved.

By using cloud solutions, projects will stay within budget and it is much easier to manage clients' cases. Real-time data is at hand and estimated funds according to the amount of transactions and other factors could be predetermined.

The final Advantage of cloud solutions is the need for fewer software or services licensing. Solutions will be designed in house and buying platforms which require huge hardware and expensive software is no longer needed.

We must also point out some of disadvantages of cloud solutions or in another words, the concerns which managers of business entities have in mind by using cloud solutions. The first and most important one is the degree of outsourcing data and functionalities. Managers may feel they have less control on procedures and activities when they outsource full functionality of their operations.

They also care about where their data is kept and if there are satisfying privacy policies available on server's site, if they lose confidential data like patents and copyright, the company may face serious financial and legal problems. They also think about data security. It is reasonable to determine whether the outsourcing partner owns the data or they just have the right to keep it for operational uses.

We must consider technical difficulties in applying cloud solutions. The need for backup power resources, data centers and retrieving data after malfunctioning software and hardware is vital. In my case, when I used Cordys Process Factory to provide a solution for Accounting Affairs, the platform did not respond to "Save" and "Check In" orders and also there are still bugs in several parts of "Report wizard" and "Schedule wizard".

Reliability of service plays an important role in applying cloud computing tools. Access credentials security and reliability is another important feature. Usernames and passwords of the users should be kept safe.

Organizational role assignment and restructuring may be needed for using cloud services. Each user should interact with certain other users and would send and receive tasks and messages. These interactions should be well managed and predefined precisely. Also there may be key positions that are necessary for managing certain services that do not exist in a company. These should be defined and a professional manifest should be designed for them.

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Richting: **Master of Management-Management Information Systems**

Jaar: **2014**

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