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Abstract

Productions and efforts of companies and their managers shall be one-step ahead of the market requirements. Such big target affects all the trade activities and processes inside the organization.

Process manager is responsible for the required arrangements and controlling various parts of the process. Sales management may be used for planning, controlling and implementation as well as contacting managers with the customers and marketing to achieve high profits for the enterprise.

The problem in this concept is missing management models in the literature also design of management process models and management data models for the sales management.

We have used BPMN2 language for modeling management process and class diagrams for data models to solving such problem. After explanation theoretical concepts, modeling process and data in sales management, the data related in business as well as managements concepts is implemented in the Microsoft Access applications.

Kurzfassung

Das Bestreben von Unternehmen bzw. deren Managern sollte darin liegen, im Vergleich zu den Marktbegleitern stets die Nase vorn zu haben. Dies gilt für die gesamten kaufmännischen Aktivitäten und Beschlüsse innerhalb eines Unternehmens. Es gibt eine Reihe von Themenbereichen, die dabei eine große Rolle spielen. Wichtig sind vor allem die funktionalen Bereiche, wie der Einkauf, die Produktion und das Marketing. Für die Durchführung und die Umsetzung eines Prozesses sind mehrere Arbeitsbereiche eines Unternehmens notwendig. Für den gewünschten Erfolg ist das Prozessmanagement verantwortlich: es stellt Beobachtungen, Analysen und in weiterer Folge Optimierung an, die dann zur Entwicklung von Standardisierungen führen sollten.

Das Absatz-Management kann für die Planung, Steuerung, Implementierung und für das Management von Kontaktprogrammen mit Kunden, Marketing und Vertrieb benutzt werden, um die Umsatz- und Gewinnziele des Unternehmens zu erreichen.
Veränderungen bei Kunden, Konkurrenten und Technologien sind Faktoren, die einen wichtigen Einfluss auf die Vertriebsorganisationen haben.

Es existieren viele Geschäftsprozesse für verschiedene Domänen, aber es fehlen Managementprozesse (Absatzmanagement).
Im Vergleich zu den Geschäftsprozessen, gibt es wenige Literaturen für Management-Prozesse, deshalb werden oft ISO Standards für Managementprozesse verwenden.

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1 Introduction

1.1 Problems and Contributions

The needs of customers, market and technology are changes so quickly, that sales managers must have close, regular connection with market. With considering all this changes, the sales manager can define a suitable plan and control strategy for sales products and relating services. Each plan and control strategy about business and management domains, involve many information's and processes that must be studies and analysis with different methods.

There are many researchers and studies about business processes, several sources have been generated for the various domains [24], [25], [26], [27], [28], [29], [30], [31].

However, in management process part, due to the lack of reliable sources, the available ISO standards are used [33], [34], [35].

Question 1: How is it possible to create a correct relation between business processes and management processes?

Question 2: How management processes shall be designed for an information system?

1.2 Expected result

Upon completion this master's thesis:

- Sales management processes shall clearly be defined and used as management activity diagrams .
- Data and Workflow models are designed.
- Prototypical implementation of sales management processes in "Microsoft Office Access"

1.3 Methodological Approach

The focus of this thesis is to study the theoretical and practical concepts in the field of data and process modeling in sales management.

This purpose will be achieving by taking benefit from Zachman Framework. Zachman is a generic framework which includes 3 main layers:

- From the view of user (user),
- From the view of designer (designer),
- From the view of programmer (programmer)

- In the first part, the management activities and diagrams related to the management processes and information relevant to the same is designed.
- In the second part, workflow processes are modelled in the business process model and notation (BPMN 2).
- In the last phase, the data relevant to an example (candle EWF) shall be implemented in Microsoft Office Access.

2 Sales Management: Theoretical Foundations

By the growth of the population and development of knowledge and technology, the demand of the public has changed. The enterprises have to apply various aspects and parts, from financial, commercial, production to IT, research, development and training professionally to achieve the customers' expectations and keep up with their competitors.

They applied long-term planning to achieve requirements to attract more customers and benefits; however, rapid changes in the demand of the customers, situation of the market, competitors, resistance against units of the enterprise and specialization of the activities prevented simultaneous having both this goals.

Therefore, in order to achieve targets of the enterprise, the managers have embarked with defining the changes as various studies. Considering the previous experiences and projects, the managers have designed the respective objectives, activities and used to plan in order to achieve the same with time and cost limitations.

Many of the plans failed to provide the minimum expected results for the managers due to ambiguity of the issues and factors. Considering the severe competitive market, the necessity of rapid and correct decision making in all the organizational levels have been made as mandatory for the survival of the organization.

In order to take suitable purpose and decisions, the managers in different levels of the organization are dependent on the precise and reliable data and information for their scope of responsibility. In order to provide data and information with proper accuracy, the data shall be rapidly entered, retrieved, made analyzable and is finally analyzed and assessed.

Today, the claim of the process management is focused on analysing, optimizing, and standardizing the processes, while such issue causes continuous growth and progress of an enterprise.

2.1 REA Accounting Ontology

Each organisation need to have powerful business modeling language to define requirement and describing economic events. Resource- Event- Agent ontology is a strong business modeling language. In 1982 the first article on REA-ontology was published by Mc.Carthy. He managed to obtain two awards from American Accounting Association, one in 1996 for the first contributing in accounting information system literature and the other one in 2003 for innovation in accounting education. With help of this ontology, you can describe events that happen in the past, present, and future. In this section, the theoretical concepts in the REA model are considered.

During recent years the REA discussion has especially been focused in ISO/IEC information technology business operation view-part 4: business transaction scenarios- accounting and economic ontology standard.

The first REA focus was trying to improve accounting system, while later due to its simplicity, it was considered and used in the educational and practical systems sectors as well. The main framework of accounting system, which includes certain elements such as debits, credits and their association with journals and ledgers, has not changed by the emergence of REA. Information may easily be store and the previous information may be subject to review.

The main purpose of REA ontology was to change the structure of the data in the accounting system in a way that conformity with the requirements for the modern systems of enterprise resource planning is generated. Therefore, more consideration and progress of REA ontology in literature in economic theory discussion were resulted. In figure 2.1 the REA primary model is seen, which includes economic resource, economic event, and economic agent.

An economic event is on one side related to the economic resource, which may either increase or decrease and on the other hand, it is related with economic agents. Each primary transaction includes at least one economic resource, one economic event, and two economic agents; i.e. the economic resources are handled by economic event between the two economic agents.

Figure 2.1: REA-Model

The REA model control incoming and outgoing of resources in an organisation.

Figure 2.2 is an example in this regard, where the candle producer (economic agent1) sells some candles (economic resource) in sale process (economic event) to a customer (economic agent2).

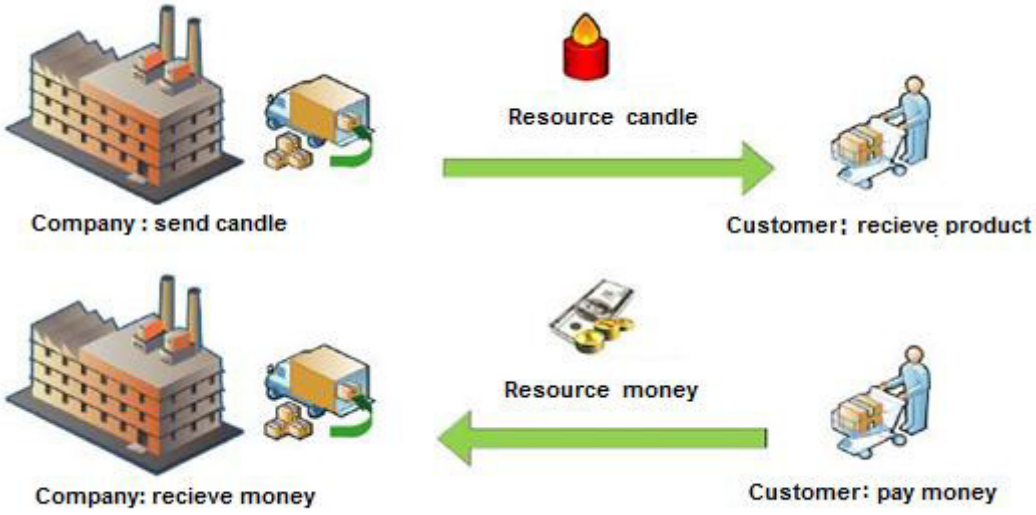


Figure 2.2: Economic event, exchange of resources candle, money

In the first part, some candles (resources) are sold from manufacturing factory (agent1) to customer (agent2), which causes a decrease resources in the factory and an increase resources for the customer; however, this is only half of the resources transfer.

Therefore, the candle producer is missing an increment event and the customer is missing a decrement event.

In order to complete such business cases, the customer (economic agent1) shall pay money (economic resource) to the manufacturing factory (economic agent2) equal to the quantity of candles he has bought.

2.1.1 REA V1- Past Events recording

Paying money against receiving product from agent is one of the economic rules. The definition given in duality principle is in the following manner: the 2nd agent shall return in the same quantity of resources he has received. REA entity is found, so that at the end of the task, both agents have equal value of resources. Such economic rules are also true for more events in a transaction and named restriction.

2.1.2 REA V2- Future Commitment handling

Transaction accounting system only reports the events occurred in the past. However, in the new and advanced systems such as ERP-system, forecasting the future is also focused. Different events such as ordering may occur in the future, while we do not need to make transaction for such forecasts. In order to store the forecasts on the future events, we use database.

The issue, which may occur in the future, are not certain and all are with a predictable probability.

2.2 Accounting & Economic Ontology

The concepts and elements in the REA Ontology have been studied by accounting & economic ontology (AEO) and the results of the same have been collected in ISO/ IEC 15994. The changes occurred in REA Framework caused much cooperation in the field of IT while in the next step, such changes and optimizations shall also be made for data. The concepts of four objects in REA ontology defined in AEO may be learned by answering the following questions:

- “Who is involved in the collaboration (Persons)?
- What shall be subject to exchange in the collaboration (Economic Resources)?
- When (and under what trading conditions) do the components of the exchange occur (Economic Events)?
- Why are the trading partners engaged in the collaboration (duality associations between resource flows)?” [15.p.25]

Economic Agent

Organizations units, companies, or persons that control resources may be called agent. A person may be an organization or individual or a certain type of public administration that has the ownership right on the resources and is able to performance trade transactions. In the definition given by AEO-standard, the agent has been called as a person.

Economic Resource

AEO-standard given following definition for the economic resource:

“An Economic Resource is a scarce good, right, or service that possesses utility (economic value) and that is presently under the identifiable control of a particular Person.” [15.p.27]

Economic Event

In the definition given in AEO-standard, an economic event is composed of at least two agents, in which the agents are responsible for handling the resources. An economic event is connected with two economic agents and an economic resource.

“An Economic Event most simply is an inflow or outflow of an economic resource. Economic events reflect changes in economic resources resulting from exchanges, conversions, or transportation.” [15. p. 27]

In next figure, some of the connection available to fulfilment the transaction can be seen.

- “A resource-flow relationship is an association between an economic resource and an economic event. From the independent perspective resource-flow instances are matched in bi-directional fashion with each party both giving and taking in the same exchange.

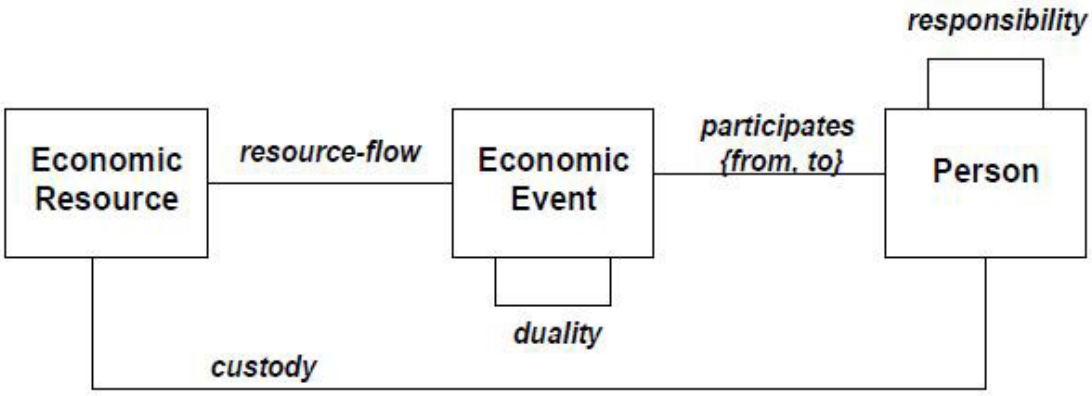


Figure2.3: REA economic events relationship according to the AEO standard

- A participates relationship is an association between a Person and an economic event. Economic events normally have two participates relationships with independent parties who have competing economic interests (that is, they are said to have an “arm’s length relationship with each other).
  One of these is specialized on the class diagram of Figure 2.3 as "from" and the other as "to", indicating again the independent perspective of collaboration.

- A duality relationship is an association between two (or more) economic events where one is the economic or legal consideration for the other in an economic exchange. Dualities are needed for every binary component of mediated transactions.

- A custody relationship is an association between a Person and an economic resource where physical control or access to physical control possession is indicated.

- Responsibility is a relationship between (among) two or more Persons. These responsibility associations indicate hierarchical orderings within an enterprise that are necessarily revealed to trading partners in a collaboration model." [15 p. 27]

2.2.1 Exchange of resources designed in REA

In figure 2.4 the changes are considerable in the resources where the enterprise and customer are linked through economic agent and deal accordingly.

All the parts of REA model, i.e. resource, event and agent are working together and none of them may not participate in the deal individually. In each transaction, there shall be an agent for the resources as the owner of the resources.

Transfer of the resources together with the relevant explanations is made through economic event. REA entity is a combination of these three parts: the first economic event includes selling resources from the enterprise to the customer and then transferring the resources from the agent enterprise to the agent customer is made. The customer pays money against the resources he received.

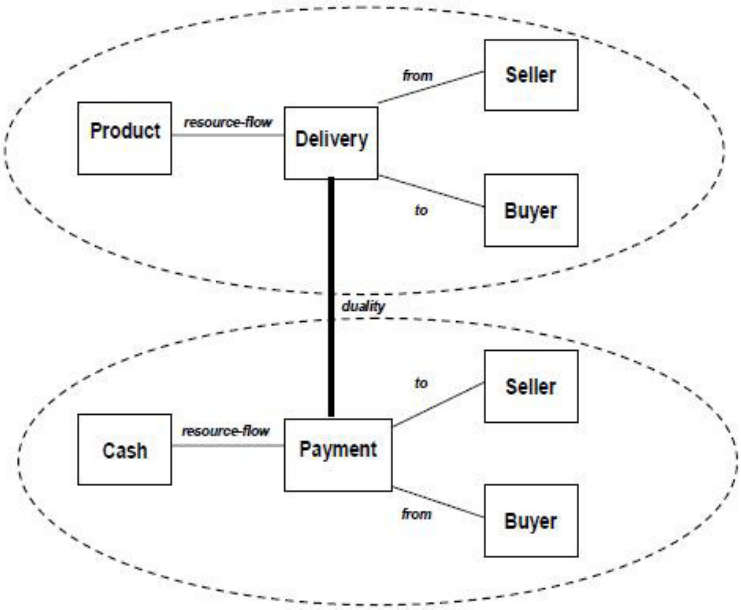


Figure 2.4: The Exchange of Resources

2.2.2 Expanding REA business ontology

In each long-term transaction, the commercial partners require more and predictable trust structure for both contracting parties. Therefore, REA ontology has been developed. Some new parts such as economic commitments, economic contracts, and economic agreement have been added to those seen in figure 2.4, which may be seen in figure2.5. The definition given from commitment and contract are in the following manner:

"A Commitment is a promise by a Trading Partner to initiate an Economic Event in the future. Performing the Economic Events fulfils that Commitment. Commitments should always be reciprocated by the other Trading Partner who commits to initiate another type of Economic Event in return.
An economic contract includes a group of commitments and contracts among the trading enterprises, which connects them with one or more economic transactions in the future. "[15.p. 78]

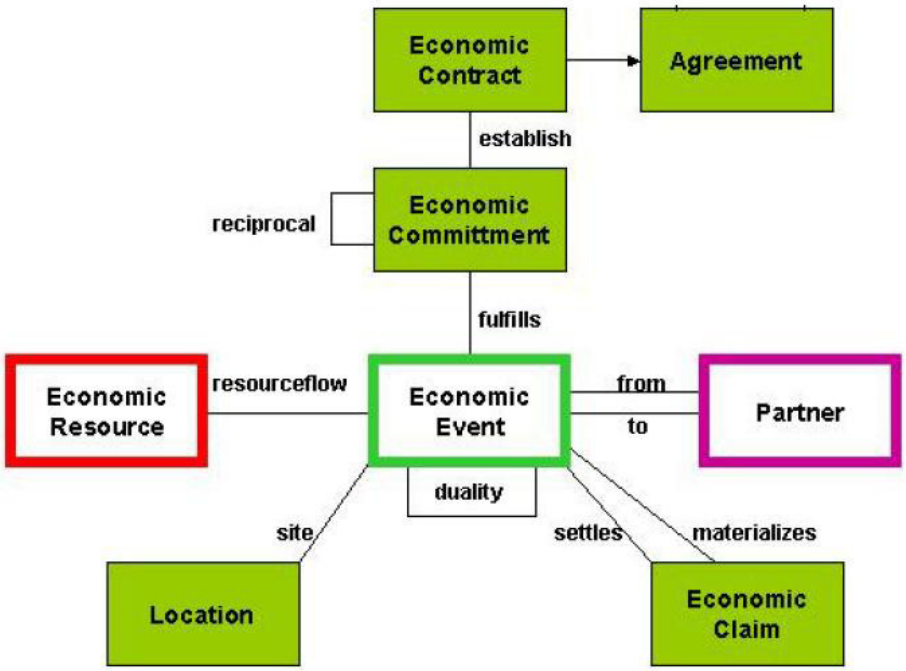


Figure 2.5: REA Business Ontology

In last figure two other objects from the REA ontology may be seen:

> "• Materialization of Claims is sometimes needed when Trading Partners insist on documentation of partially completed exchanges (for example, when a Customer takes possession of an Automobile before paying for it in full). If needed, Claims can be instantiated by documents like invoices or by accounting, artefacts like accounts-receivable. Their inclusion here is more a matter of business custom than ontological completeness.
>
> • A Location is another object that is sometimes needs to fill out the specification for a full economic transfer. Locations simply identify the place where Economic Events take place." [15.p. 78]

2.3 Cybernetic Management Ontology

There is a variety of definitions regarding the management expresses. Therefore, presenting a unified definition of the same is quite difficult. The management concept may be studied with respect to different viewpoints, including:

- Information processing view,
- process- oriented view,
- Institutional processing view,
- Instrumental view,

In business, the concept of management has been defined by cybernetically oriented in a way that in the same the process of directing, leading and controlling the processes are understandable.

In this model, the purposes of an organization are with considering the uncertain future and environment studied and defined. In management, the main challenge is in systemic merged the business system with the management system. Such combination requires a known about structure and system to see and think.

For modeling and visualization of this structure, we use the PDCA framework which includes Plan, Check and Act in the management system and Do form in the business system.

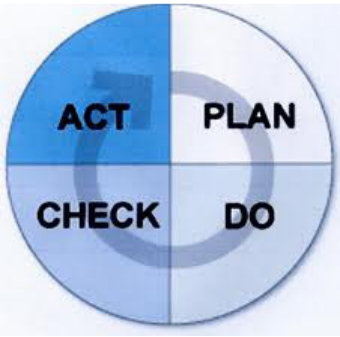


Figure 2.7: PDCA-cycles

“The Plan – Do – Check – Act (PDCA) cycle is the operating principle of ISO‘s management system standards.

- Plan – establish objectives and make plans (analyze your organization‘s situation, establish your overall objectives and set your interim targets, and develop plans to achieve them).
- Do – implement your plans (do what you planned to).
- Check – measure your results (measure/monitor how far your actual achievements meet your planned objectives).
- Act – correct and improve your plans and how you put them into practice (correct and learn from your mistakes to improve your plans in order to achieve better results next time).” [20.p.428]

There are different types of management system, such as a reactive and a proactive. They can be implementing in PDCA framework. In this thesis we using first one that is a feedback process. In cybernetic feedback mechanism, the realized value will be compared with plan value. The deviation is used to regulate the operating system. There are two types of cybernetic management systems, one of them is a closed loop cycle and is the traditional control system .The other one is an open loop control system . The different between these two systems is on comparing the planning with actual values. This comparison happened only in closed loop cycle.
A closed loop management has been shown in figure 2.7 while it is based on the cybernetic control theory and repeated during the time. There is a time period distance between the commencement and finishing of the process.
Close associations between planning and controlling systems are quite important, so that Harvath tells: Separate analysis from the planning and controlling the processes is meaningless considering the close association of these two with each other.

“The integration of the planning and control framework, the PDCA-Cycle and its related information flows is realized by using MGT-Activity-diagrams. In the MGT-Activity-diagram the object and process orientation is implemented by simultaneously modeling the managerial PDCA-Activities as processes and the related information flows as objects.” [20.p.429]

Kuepper has addressed the relationship between the two aforementioned discussions through cybernetic perspective, which is a tool to solve the complexities between these two discussions.

There are two solutions to generate the relationship between cybernetic and management:

In the first way, cybernetic focuses on analyzing the system while these analyses are also performed in the management.

In the second, control loop in the cybernetic is used as a tool to control the system elements. In the following table information's relevant to the (Act) control is categorized in feedback and feed forward formats.

		Prüfgröße	
		Actual	Forecast
Normgröße	Plan (Soll)	Feedback	Feedforward
	Benchmark		

Table 1: Control form determines information Feedback, Feedforward

Such values are obtained from comparison of the plan-value with the actual-value in the classical form. Plan-value in risk controlling, Plan-Value in cost controlling as well as benchmark- value are resulted from comparison the benchmark/ Actual in bench marketing.

The comparisons made with the actual value are relevant to the past, which are called as standard deviations available in the feedback, while they are as input for the act activity.

In addition, the table indicates that the feed forward information is resulted from comparing the plan values with "Forecast". The Forecast value is resulted from the information obtained through time. Eventually, by comparing the Plan/Forecast we may guess the potential changes in the future and think for solutions regarding the potential deviations. [9]

2.3.1 Management cube

In the following cube the different states which may be studied in management are observable by considering the information on control, i.e. single vs. double loop, open vs. closed loop and proactive vs. reactive loops.

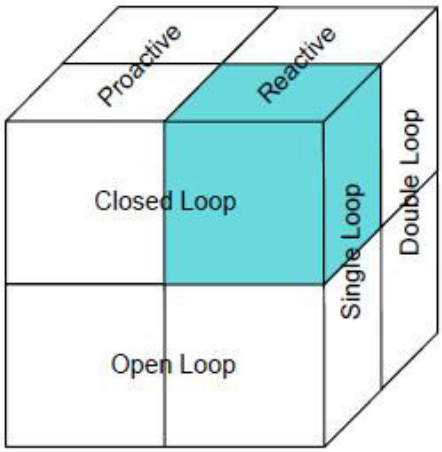


Figure 2.8: Control System Design – Control Process Variants

A closed loop management may be designed in the form of close single loop management with corrective nature, or otherwise in the form of closed double loop management with corrective and adaptive natures.

A management loop may be designed in the form of open (singe/double) loop management. If the measured information transformed into future related information than the process gets proactive.

In the next step we study the various cybernetic aspects existed in the PDCA processes at an enterprise. Having plans helps highly in identifying the purposes and implementation of the same. On the features of plan, identifying the association and logic between the incidents and processes, which we have considered for the future, may be named. Having complete information about processes and resources from the future at the beginning of the issue is quite difficult or even impossible. Planning causes to collect the data through information and analyzed to fulfil the future policies. Therefore, we shall be able to perform the required forecasts on cases, which prevent us to reach our goals.

After implementation of the planning, plan value is identified through monitoring the process. This value is transmitted from a decision making process to the executive process after being defined. In the next steps, the actual value is compared with the plan value in the control process. The data obtained from this control are re-entered into the system and the errors existed in the system are corrected in this way in the process to prevent reappearing such problems in the future.

„In der Sprache der Kybernetik ist es folglich Aufgabe der Betriebswirtschaftslehre, die Regel- bzw. Steuerkreise zu erforschen, Empfehlungen zur Gestaltung der Systemkreise und deren Elemente zu geben, Hilfen bei der Bildung von Reaktionsmodellen zu stellen und dem Regler (Management) Vorschläge zur Einstellung der Stellgrößen bei verschiedenen Störungen zu unterbreiten.“ [7.p.28]

As we know, sales management is an important part at any enterprise. Therefore, having plan in this part is considering as an essential and unavoidable issue. In the next chapter, the processes existed in the sales management through PDCA-framework will be study.

2.4 Process Modeling with BPMN 2

In order to indicate the processes in all aspects, including in the data flow, and the rules addressed, we require suitable notations. Notations are quite important in graphical modeling the working with processes. One of the tasks they do is to display different elements of a process, their meanings and the connection existed among these elements. The conformity available in such languages results in its easy understanding by the user of such model.

The first Business Process Model and Notation (BPMN2) version emerged in 2004 by Stephen A. White who was working at IBM Company. At the same time, BPMI was converted into a part of the OMG management group. This organization is known for the production of various software standards, including UML.

Properties

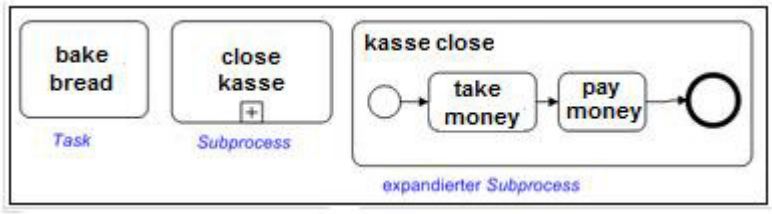
BPMN2 is a graphical model that used for professional and technical displays of the working processes. The difference of these two formats is in the level and focusing on the process details.

In the professional part, the focus is on understanding the mainstream of the processes and in the technical part; the focus is in minor issues such as logically formulae.

The new purpose of BPMN2 includes making and advancing a certain language, which is understandable for all the groups including those analyzing the processes as well as the public and managers. [23]

BPMN Modeling Elements

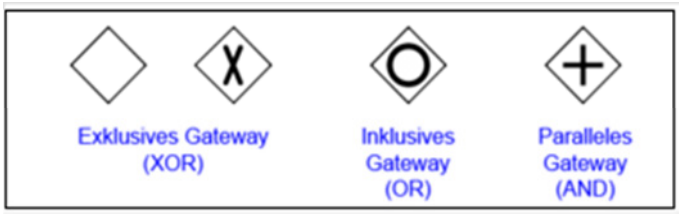
Task: A task is an atomic unit of work. It represents the task to do. A sub processes can be represented in a collapsed or expanded state. It can be linked with another process diagram. They vary in the notation by a + symbol.



Event: An event is something that can occur in a business process, such as the arrival of a message, the achievement of a certain date or the occurrence of a situation. Events are dividing into three classes. According to their position in the business process to start, intermediate and end event.

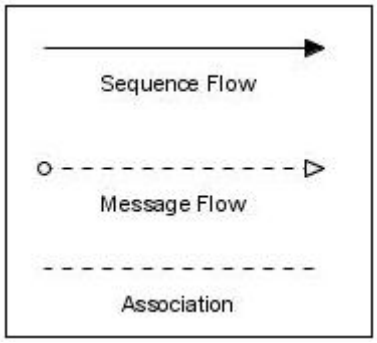
Based on their impact in the business process in catching and throwing event are divided of its kind in timer, message, exception event, etc. Each event type is familiar with the notation own icon that appears inside the circle symbol for the event.

Gateway: A gateway is use for controlling the governance and divergence of sequence flow in a process. It has different Type of models e.g. Parallel-, Inclusive- , Exclusive-, Gateway.



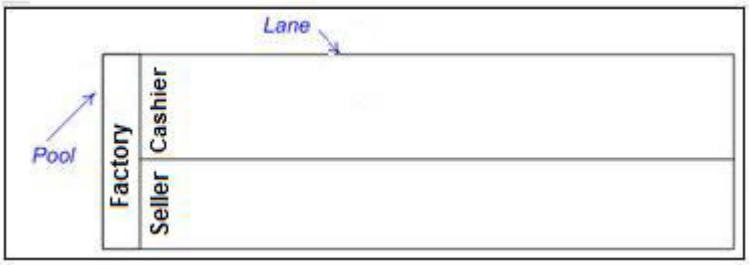
Sequence flow: Sequence flows symbolize by solid arrow, and represent the information transfer between two subunits of a pool.

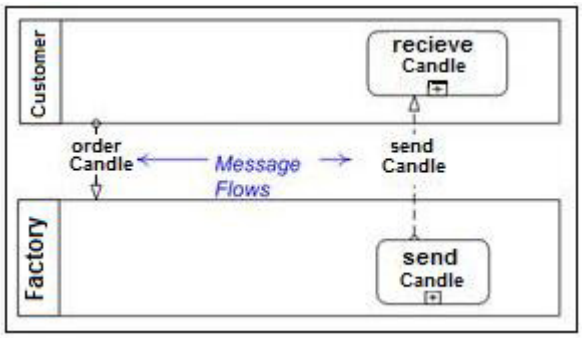
Message Flow: Message flows symbolize the information flow across organizational boundaries. Message flow can be attached to pools, activities, or news events. The sequence of message exchanges can be specified by combining sequence flow and message flow.



Pool: Pools represent organizational units and can be fanned or structured under further through lanes.

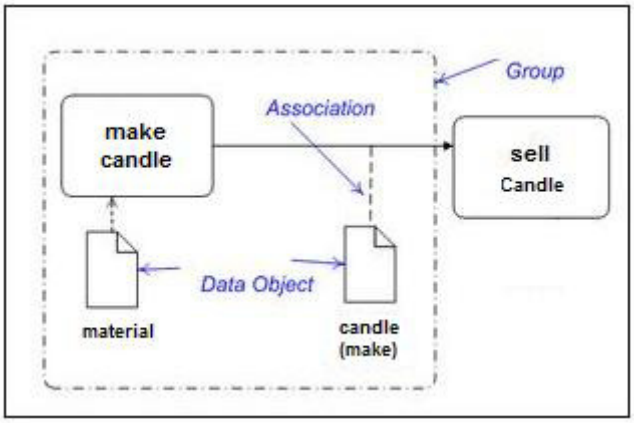
Lane: Lanes represent responsibilities, such as organizational units, jobs, or IT systems. Lanes can be structured hierarchically into sub-lanes. Pools and lanes represent roles.





Message: A message indicates the content of the communication between two participants.

Data Object: A data object can attach to a message-, sequence flow with a dash line. Through the name of the data object, you can know that which information e.g. letter, e-mail, document transformed in the process.



2.5 Data modeling with Class Diagrams

In software engineering, a class diagram is a type of static structure diagram in the Unified Modeling Language (UML) that describes the structure of a system, methods, attributes and the associations among the classes. A single class cannot represent the whole module in a project so we need one or more classes to represent a module. The connection between them will be doing through associations.

“The class diagram is the main building block of object oriented modeling. It is used both for general conceptual modeling of the systematic of the application, and for detailed modeling translating the models into programming code. A Class diagrams can also be using for data modeling. The classes in a class diagram represent both the main objects, interactions in the application and the classes to be programs.” [40]

A Class diagram includes three sections:

First section includes the class name. Typical name conventions suggest the classes’ name that is in the top of rectangle box and begin with the capital letter fallowed by lower case letters.

Second section of the diagram should include the data and attributes. The diagram with minus sign displays all private attributes. The # symbol shows a protected property.

The third section of classes diagram includes the list of methods. The methods name can includes parentheses, which indicate what kind of data, expects input parameters. Some methods do not required any inputs, in such cases, the parentheses remains blank.

In the design of a system, a number of classes are identifying and grouping together in a class diagram that helps to determine the static relations between those objects. With detailed modeling, the classes of the conceptual design are often splitting into a number of subclasses. [40]

Relationship

A relationship shows with a line between classes and have labels for identifying the actions relates with classes. It covering the specific types of connections found on objects and class diagrams. The relationships in UML are:

Association

An association is a structural relationship between classes, by drawing a line from one class to another and they must be at the same level.

"Binary associations (with two ends) are normally represented as a line. An association can be named, and the ends of an association can be adorned with role names, ownership indicators, multiplicity, visibility, and other properties." [40]

Aggregation

An Aggregation is a special type of association. It is a relationship between a whole and a part. One class represents the whole and another class represents a part.

“As a type of association, an aggregation can be named and have the same adornments that an association can. However, an aggregation may not involve more than two classes. Aggregation can occur when a class is a collection or container of other classes, but where the contained classes do not have a strong life cycle dependency on the container—essentially, if the container is destroyed, its contents are not. In UML, it is graphically represented as a hollow diamond shape on the containing class end of the tree with a single line that connects the contained class to the containing class. The aggregate is semantically an extended object that is treated as a unit in many operations, although physically it is made of several lesser objects.” [40]

3 Process modeling for sales management

Since industrial revolution, the competition and production in the industry section have significantly increased due to the innovations in the field of technology as well as advancements achieved in the works of the organizations. In the 50's, computer and electronic communications started to influence on the processes and trade transactions.

Today, creativity and innovation in the field of communications and computer play a quite important role in the business process changes. In order to understand the extensiveness and scope of changes in the information and working processes, we need to define analysis and model the processes. The aforementioned issues play an important role in sales management, which is because the requirements of the market ad customers are continuously changed and in order to be able to compete our competitors, we need to analyze, model the information and processes relevant to the changes. Have a proper system to model the business and management domains together are the main challenge for design them.

In this chapter, the processes relevant to the business and management are modelled.
First, we will be modeling the sales business process and in the further stage by taking benefit from double loop management, the management processes relevant to PDCA-cybernetic shall be modeling by using the BPMN2 program.

Closed loop management

The classic sample of closed loop management may be seen in figure 3.1. There are two types of information in the management loop that must be compared with each other. The information exiting in check process that comes from business process is stored in a data object, namely actual value. In the next step, the values achieved in reality, i.e. actual value, are comparing with the values of forecasted (plan value) in the gateway. The results of comparison interred to the act activity through data object deviation. In case the result values are not acceptable, and the difference between

the plan and reality is high, then the strategies shall to change and correct for the future planning.

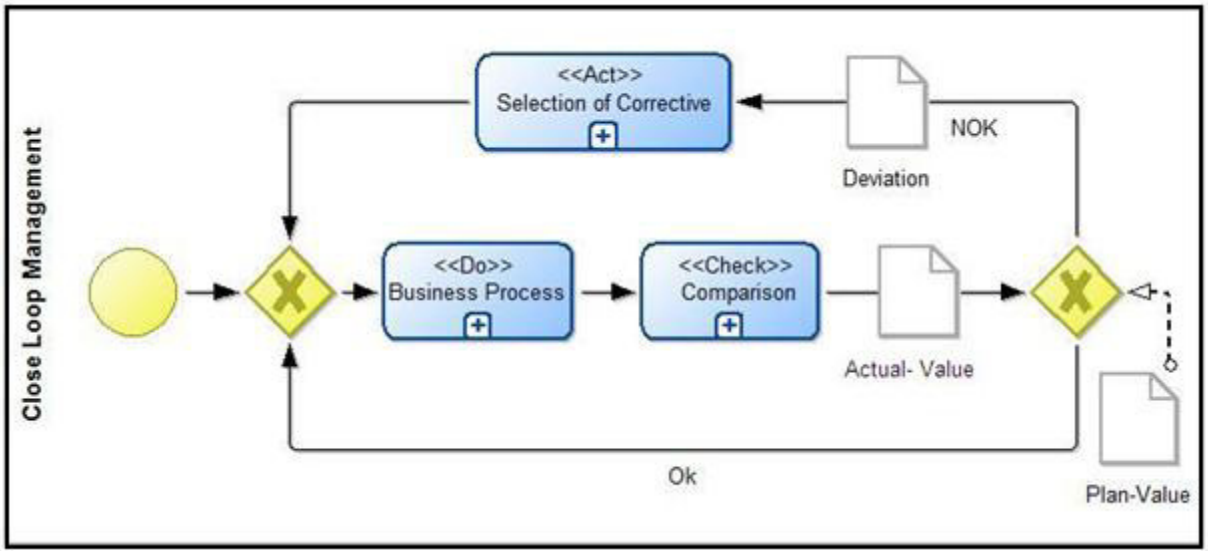


Figure 3.1: Closed Loop Management

In the next step, the change information is re-entered into the system and the Do-process starts working with new information and methods. Therefore, closed loop is a certain case of the open loop in which the plan/actual values will be comparing and the relevant results return to the system.

3.1 Modeling the Sales Business Process

3.1.1 Overview

In business science, the sales process has proposed to sell a product. Businesses are in place to make sales. The sales business process supervised and measures the ability of each staff to support either sale and the actual sales to customers. An effective sales management strategy involves setting targets, the sales support, and training, creating or updating the sales strategy and monitoring results. The sales management process may have objectives for individual departments and the entire enterprise. This involves updated communication aims based on performance, the competitive situation, and the economy. As soon as targets have been set, the sales

management process provides information about marketing strategy and product to achieve these goals. It is important to have an adequate managements system for recording and implementation the business transactions.

At the beginning of this chapter the business process such as Cashsales -, Order process with an example is modelled. In the second part the relevant rules and policies in management's part will be discussed and have been modelled as a BPMN2 diagram. In the next figure, the relevant rules, information and data ,which are required for order-, sales- and payment-processes are illustrated.

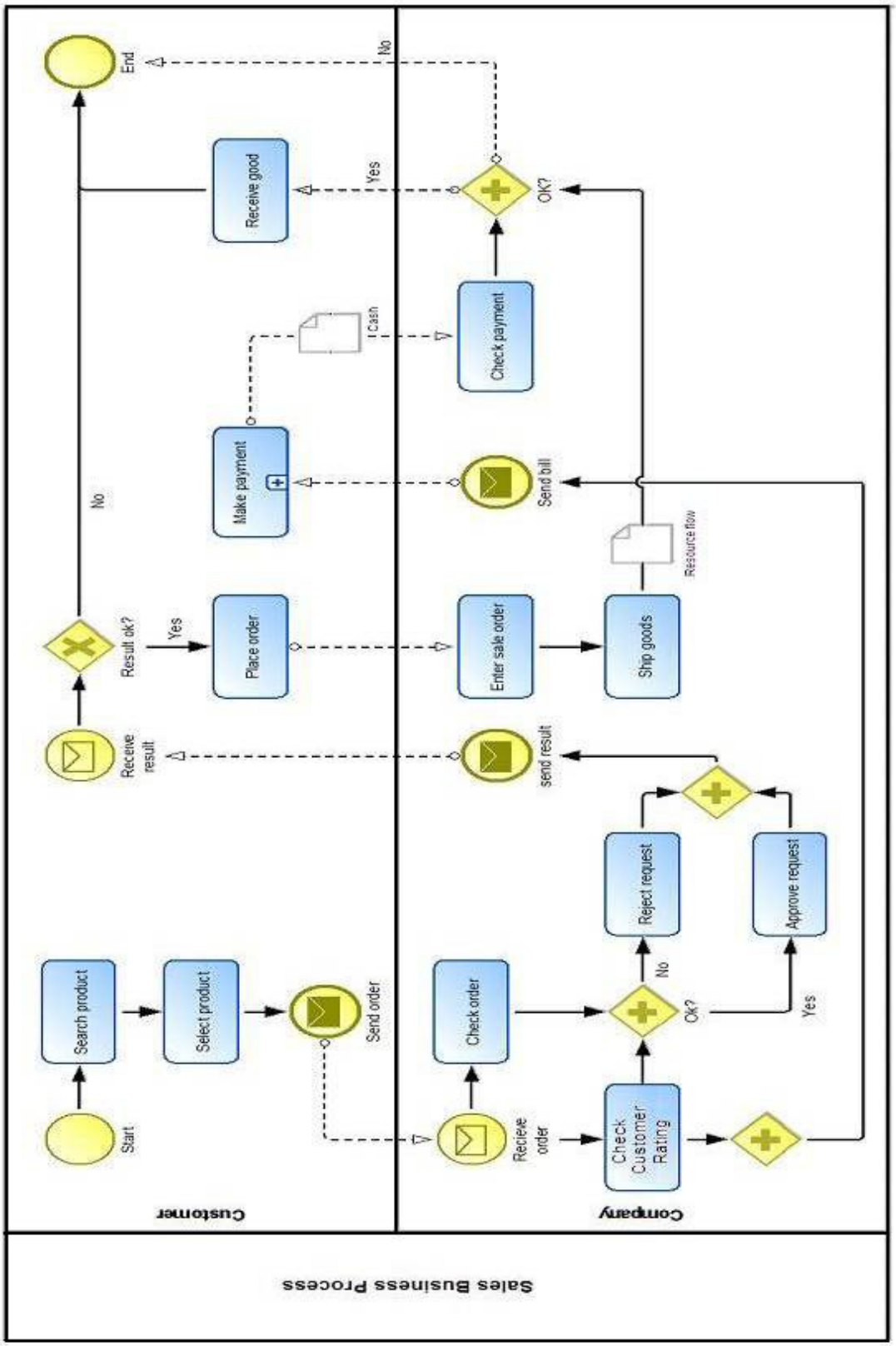


Figure 3.2: Sales Business Process

3.1.2 Cash Sales Process

A sales process is a series of customer focused steps that enables the sales person to substantially increase win rates, build customer retention and increase revenue production. Each step consists of several key activities and has a predictable, measurable outcome. A clearly defined sales process can help you achieve success.

Figure 3.3 shows the cash sales part of the sales business process that illustrates in last figure. This section begins after receiving the control result from previous part through message event. The customer can accept the result and place order, or rejects it and the process ends.

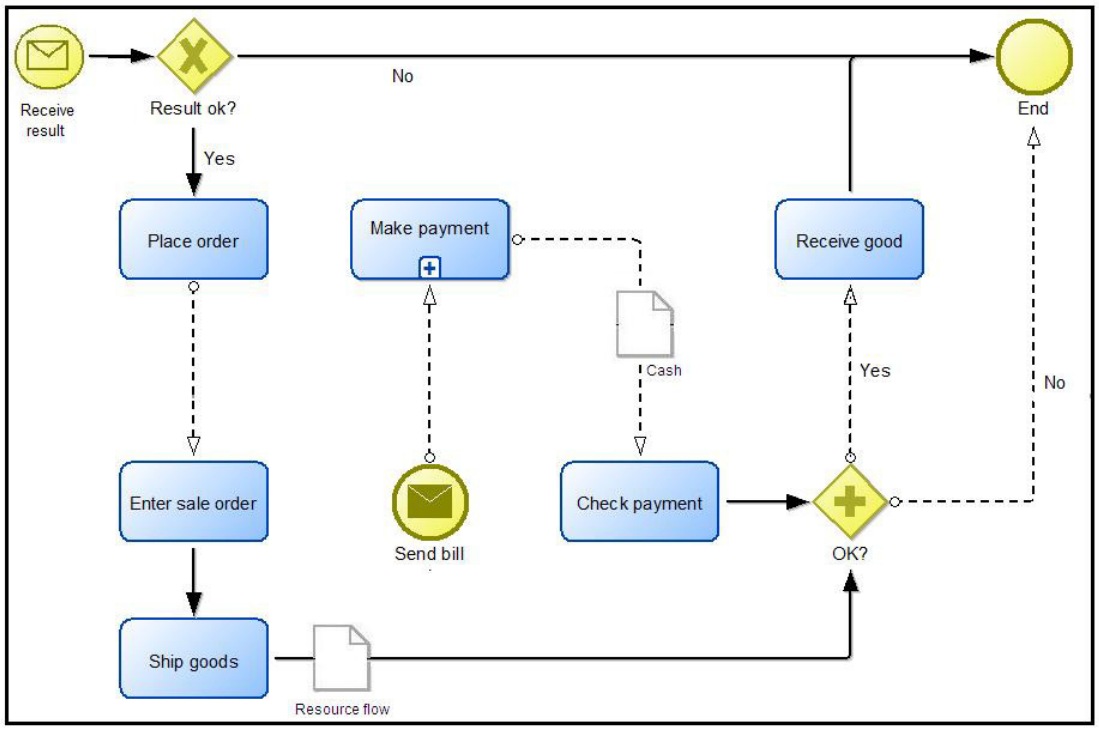


Figure 3.3: Cash Sales Business Process

By placing order the sales order will be enter into database system and process flows into the shipment Department. The information relevant to ship goods will be send to the gateway for processing together with cash data's. The bill will be prepared by the finance department and information's about payment will be sending through data object, which named cash to the customer. A data object can attach to a message-, sequence flow with a dashed line. Through the name of the data object can you know

that which information is transformed in the process? By confirmation of payment and shipment, customer receives the good and the process ends successfully. Else it will be rejecting and the process ends.

3.1.3 Order Process

A purchase order is a request form a customer to a manufacture, dealer or service provider for the provision of a product or a service. The order flows in most cases in a contractual relationship through with both sides agree to settle the agreement.
The order process is initiated by the start event ,only one start event for a process is preferred. A customer search and choose the product and send his order throuth an end massage event to the begin massage event in the enterprise lane. These two massage events have a connection through massage flow.The massage flow is symbolysed by a dashed arrow represents the information transfer between two pools.
After receiving purchase Order ,sales department must check some points e.g. (Customer account, stock level) in the request and send the positive or negative result to customer. On the other hand financial department checks customer account. The result of these two controls will be send to the customer through a message event.

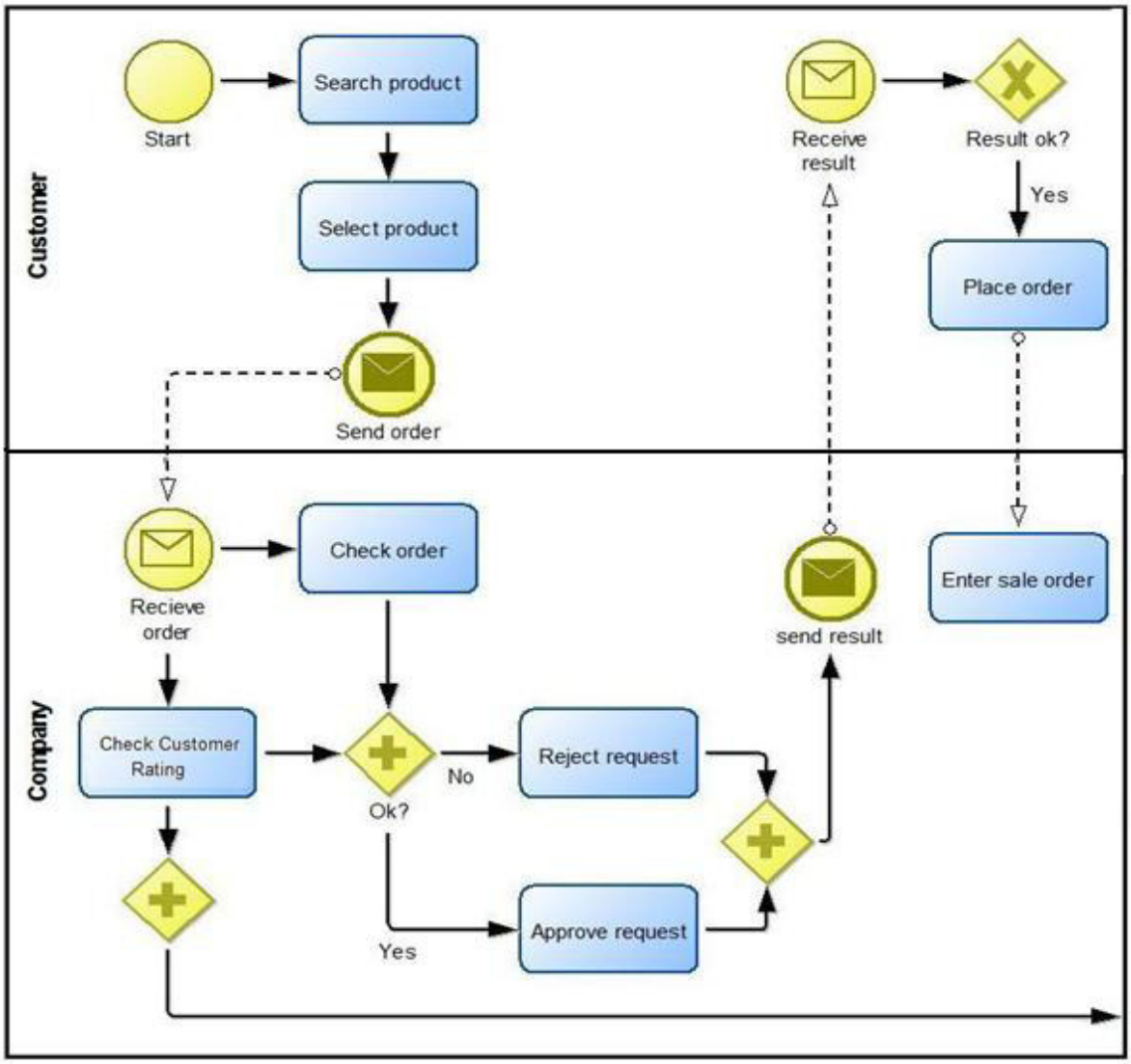


Figure 3.4: Order Process

3.2 Modeling the Management Process

3.2.1 Overview

In this part, we study the management system and its relationship with the PDCA-process for the sales management. In figure 3.5, the details available in the PDCA-system have been indicating considering their relationships with each other in the management system by taking benefit from BMPN2. In this figure, also the business management, which includes Do-activity, is remarkable.

In planning part, details on each part of the transaction and the expected value are studied which eventually results in a complete definition on sales plan. Whereas a planning system is composed from smaller programs considering the quantity and type, therefore, we need to realize different planning methods. In view of the fact that they change through time dynamically is also important.

Out of all such studies a sales planning is resulted which is continuously controlled, thus it has the dynamic nature. First of all a plan for one year is designed which the processes are controlled at the end of this one year and the data obtained from such controls indicates that how much the planning has achieved in reality. The problems, which result in deviation, may be in the section of the business system or in the management system. The deviations occurred are corrected after being studied and either transferred to the planning-activity, which is known as the adaptive instructions, or to the Do-activity which is the executive part of the process, in which case it is called as the corrective instructions. After rectifying the problems in the first year, we start to planning for the second year and at the end of the year again study the deviations and problems existed, while this process is also repeated for the next years.

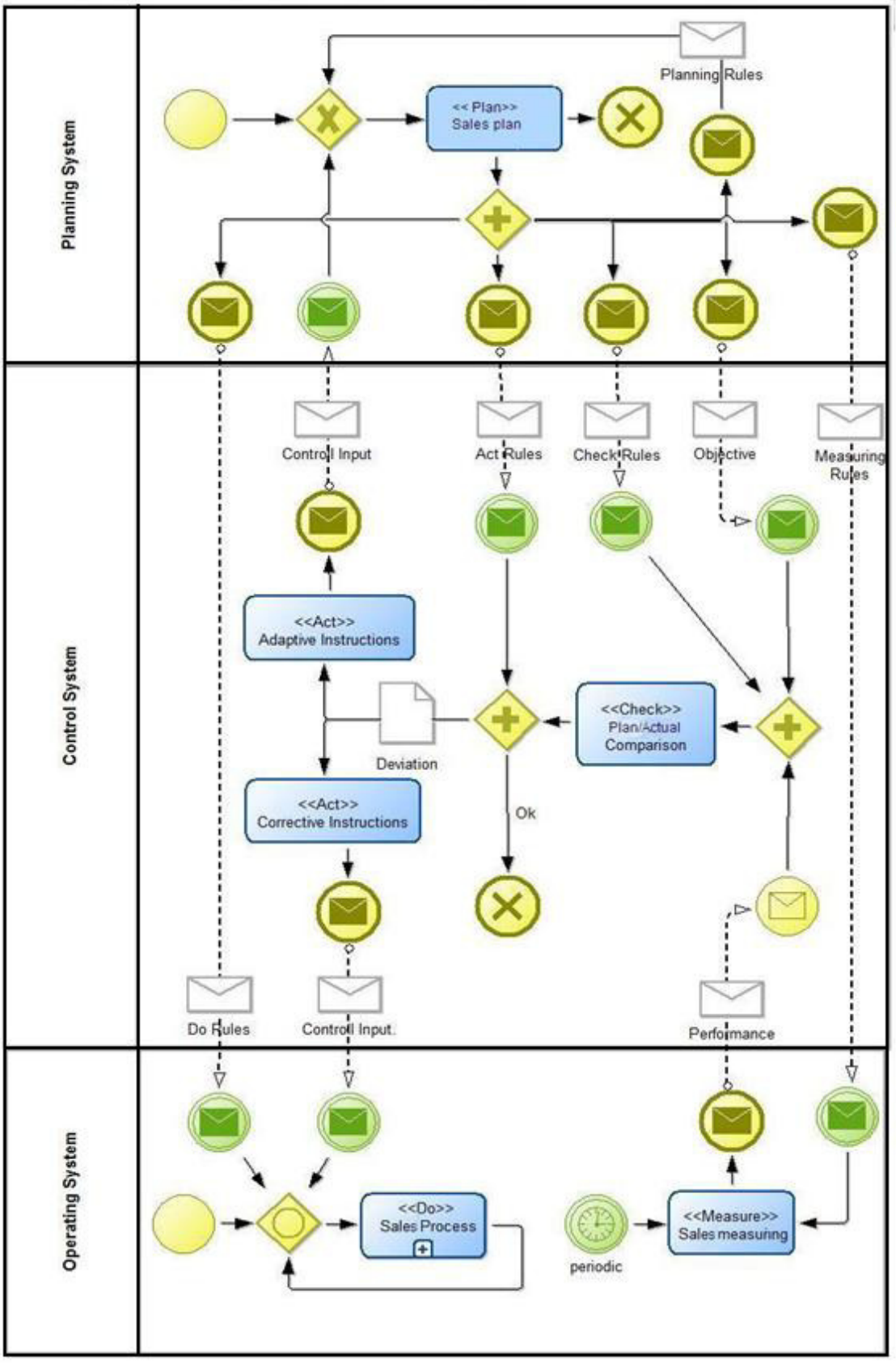


Figure 3.5: Cybernetic MGT Framework –Reactive Closed Double Loop

3.2.2 Sales Business Process

In the following figure, Do-activity may be seeing in the form of a sales process, which is composed of a starting point. The obtained information from Plan-activity (Operating rules) and Act-activity (Corrective rules) is entered into the Do-activity through sequence flow. At each part of repetition, the processed information in the Do-activity are re-entered into the system.

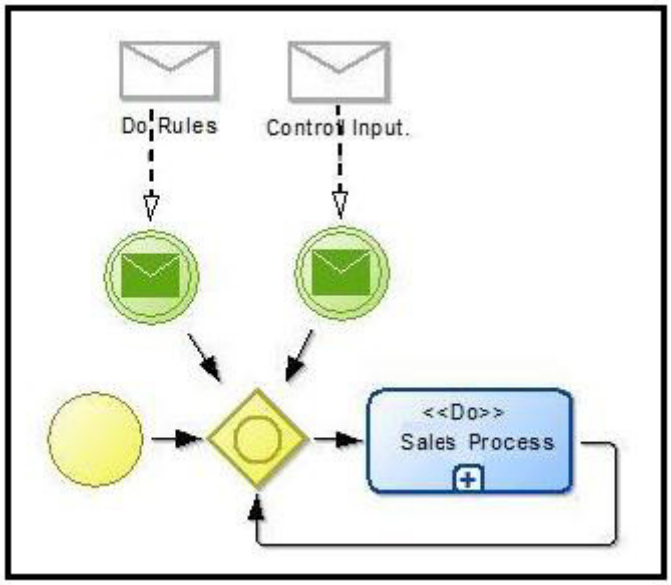


Figure 3.6: Operating process

3.2.3 Planning Process

Planning is required for the success of any organization. The primary factors effective in increasing the success of a project, including increasing productivity, identifying customers need and flexibility. These factors are increasing with a good and correct planning.

Hovarth considers planning as unit with control. He says that planning shall be completed with control.

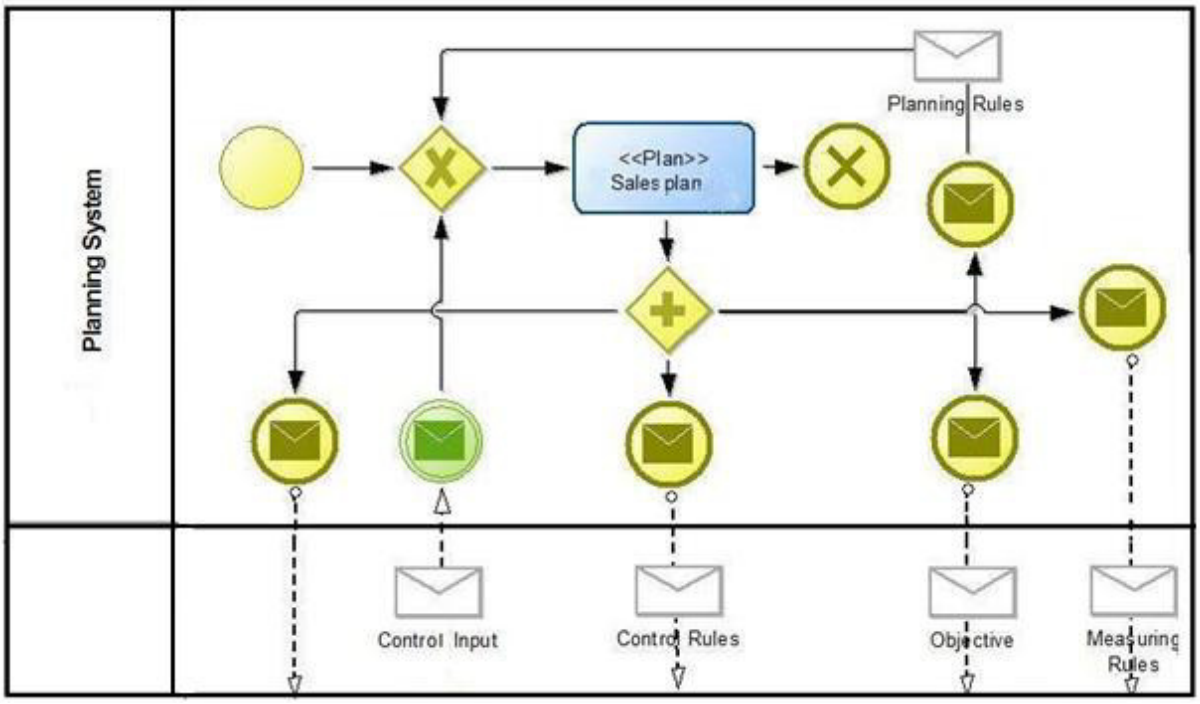


Figure 3.7: Planning process

Figure 3.7 may be seeing as a first section of the figure 3.5. Two different parts of the planning system may be considered in which the planning process is performed in a variety of methods. The starting and finishing points are presented with circles. In planning, the information entered into the process from the starting point is processes and sent to the end event message. After that output information like Do-, Measure-, Control-, and Plan- rules as well as objectives are transmitted to the other parts of the system such as Measuring, Do and Act processes by sequence flow.

Second part of planning system includes a process that is repeated during time, i.e. certain information and values processed in the system and eventually reached act are again entered into the planning system through sequence flow, which is known as the instructions for sales MGT adaptation.

3.2.4 Measuring Process

The measuring-activity existed in the operating system has been shown in Figure 3.5. The difference between this process and the previous processes is in their starting points. In the planning process, the starting point was a circle, while in this process it starts with the sand clock. We use such symbol in the systems in which process control is repeated within time intervals. For example, the sales are controlled in quarterly or annually time intervals.

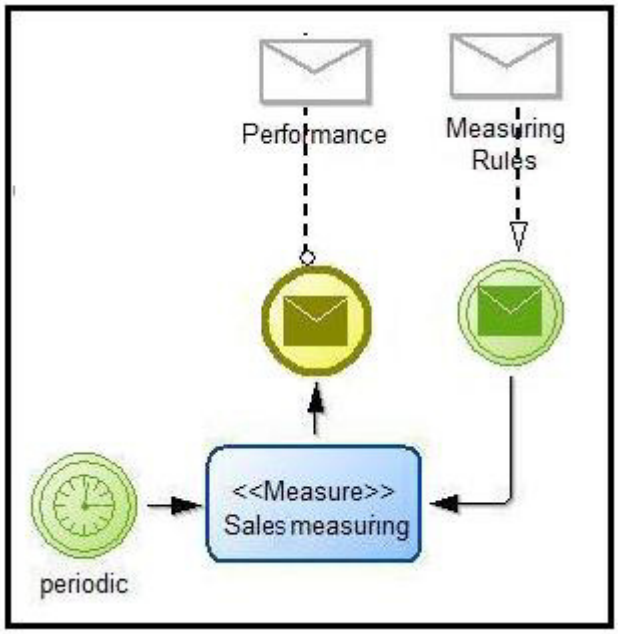


Figure 3.8: Measuring process

Information about measure rules that comes from plan activity is transmitted to the measuring-activity by message flow.

3.2.5 Check Process

In the following control system, the performance value, which obtained from the measuring-activity as well as the standard of performance, which is set as objective, is compared in the manner in Check-activity. In case there is no error in such comparison, then the process is completed; otherwise, the errors are transmitted to

the Act-activity and return to the Do- or Plan-activity in the corrective or adaptive manners.

In the following figure, a process with final control may be seen. Information, which is obtained from processes, i.e. sales plan for the next year and the quantities, achieved in reality after one year are compared in the form of Plan/Actual. In case of deviations, the problems for the last year or last quarter will be sending to act-activity through a data object, which called deviation.

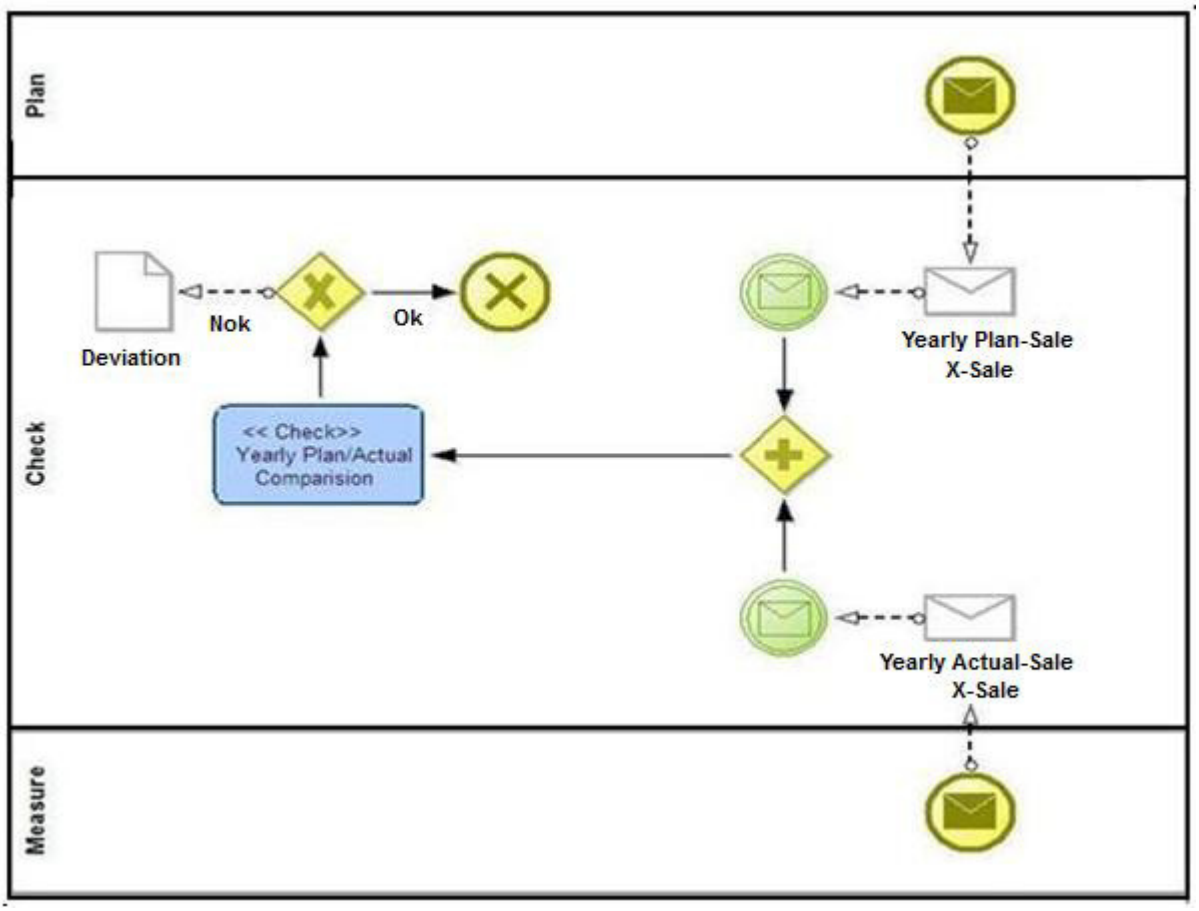


Figure 3.9: Reactive regulation with final control

3.2.6 Act Process

In this part, the result of comparing plan value with actual value saved in deviation shall be sent to act activity. Deviation value shows us how much the planning has achieved in reality. The problems in the section of business- management will be corrected or transferred to the Do activity called as the corrective instructions. The

other sequence flow sends the information in form of adaptive instructions to re-plan the system to the planning system. This method helps us to prevent reappearing such problems in the future.

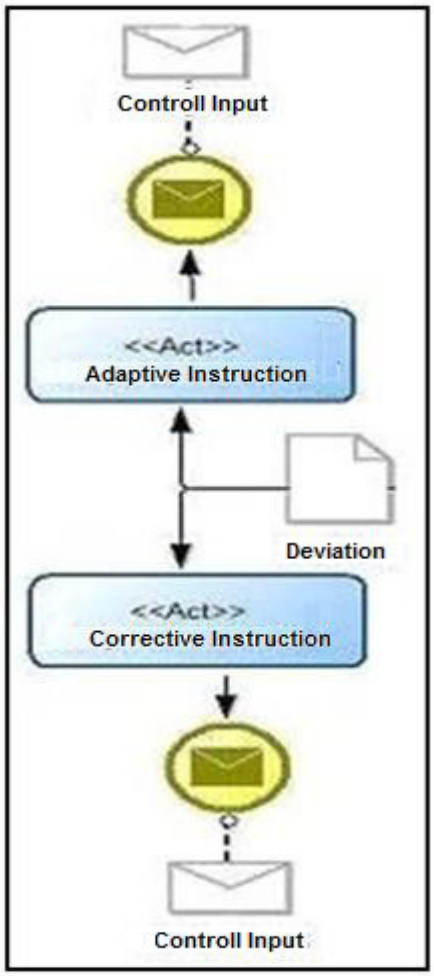


Figure 3.10: Act process

4 Data modeling for sales management

Regarding the data and processes in the business case and economic contract, business ontology have been developed and changed after being defined in the REA accountin,. Following the changes made and the combination between REA ontology and cybernetic management framework, there was a new ontology in REA namely REA management ontology.

Cybernetic rules including activities and information relevant to the management process in the different parts of this ontology, which have been modelled together with the MGT activity diagram.

In order to define the required policy infrastructure, in REA management ontology the rules existed in the cybernetic management are used. Such ontology has also used the Zachman framework to merge and implement the accounting based MGT-Info system with REA management ontology. [6]

In previous chapter, in part 2.1 the principal concepts on REA ontology such as resource, event, and agent have been defined. In addition, we tried to explain the REA business ontology discussion through expressing processes and relations relevant to the same.

The focus of this chapter is on data modeling with class diagrams for two levels of REA ontology, i.e. REA business ontology and REA management ontology. Data modeling helps us to analyze and study the information and communications between different factors such as number of goods, customer details, contract, etc. REA business ontology and REA management ontology including acting rules, measuring rules, planning rules, which are exchanged among resource, event, and agents at the system.

In the first part of this chapter the data available in the REA business ontology with expressed examples on sales business process is modelled.

In the second part, the data and associations existed in the REA management ontology is studied.

4.1 Data Modeling for the Sales Business Process

The main idea of REA ontology is to describe the current economic phenomena at the enterprise with the purpose of improving the accounting system. REA has been extended after years to a business modeling ontology, which includes the following three parts:

(1) The operational layer,
(2) The planning layer, and
(3) The policy layer

The main REA model was based on the operational layer where the main principles on the events to be occurred in a deal were addressed. As also mentioned earlier, REA includes 3 main concepts economic resource, economic event and economic agent while in data modeling we study the association between such concepts. Data modeling design correctly and precisely is a great assistance in designing the database which shall be focused in the next chapter.

4.1.1 REA Business Case Data Model

Figure 4.1 is a general data model of the business case. The Debit Events and Credit Events are the objects relevant to this business cases which are placed in the middle of the shape. These two events are on one hand connected to the relevant resources and on the other hand to minimum 2 agents. Each event shall at least have relationship to a resource and may increase/ decrease it. In such cases the relationship type is called stock flow. In this example, association between the event and resource is one-to-one type, i.e. a resource is connected to an event. Each event entity shall be connected at least an event. The association among the events is made through Duality principle and value restriction. Duality principle is about piece of transferred resource and value restriction is about value of transferred resources. In this example the association between the debit-, credit events is made through Business Case.

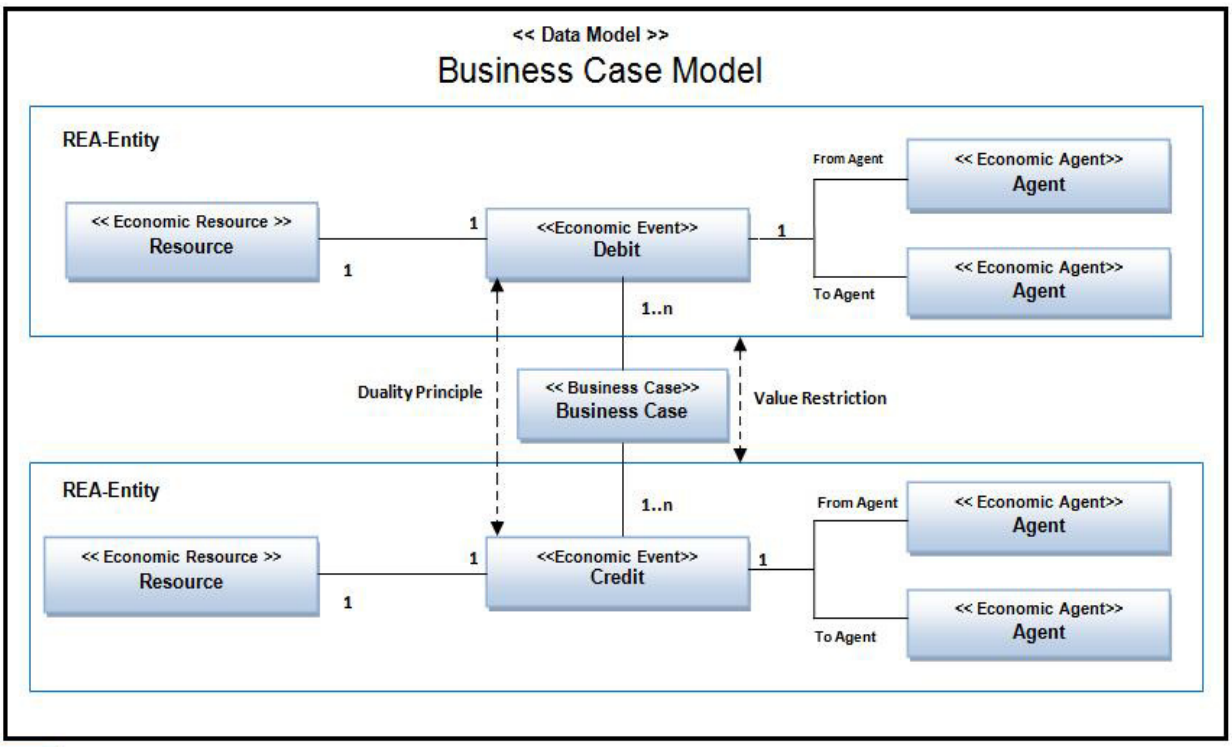


Figure 4.1: REA Business Case Data Model

4.1.2 Sales Business Case Data Model

The main issue of this part is on modeling the data available in the sales business process. In order to understanding better the contents, like previous chapters we use candle EWF example. There are four kinds of resources that can be transferred through agents. The employees with various designations for example salesman, cashier, etc. are working to fulfill the relevant tasks.

Resource candle is related to the sales event through one-to-many association, which indicates that in order to sell resources, at least one candle shall be existed. On the other hand, customer may buy one or any other number he desires through sales event. There is a rule in REA ontology explaining that the value and quantity of resources in the company must be equal. This is why the same value of resource cash will be transfer through payment event from agent customer to agent cashier. Such resource is related with the event payment which increases such resource after payment.

There are other kinds of events that do not directly result in an increase or decrease in the resource value. For instance, in case the customer places an order, in fact no change has been made in the resources and such activity is called commitment event. Such events shall happen in future and support to make better planning and services for companies.

Resource candle is relevant to the sales commitment through label reserve. Such issue indicates that the same quantity of candles must be existed in the order shall be reserved for future sales.

Also economic resource cash is related with label reserve to payment commitment. That means in the future the money to receive the candles shall be paid.

As it is seen, the agents are related with the events and with the commitments. In all such cases, one agent is present.

In the next figure all the associations which are existed between the sales, order and payment processes have been indicated.

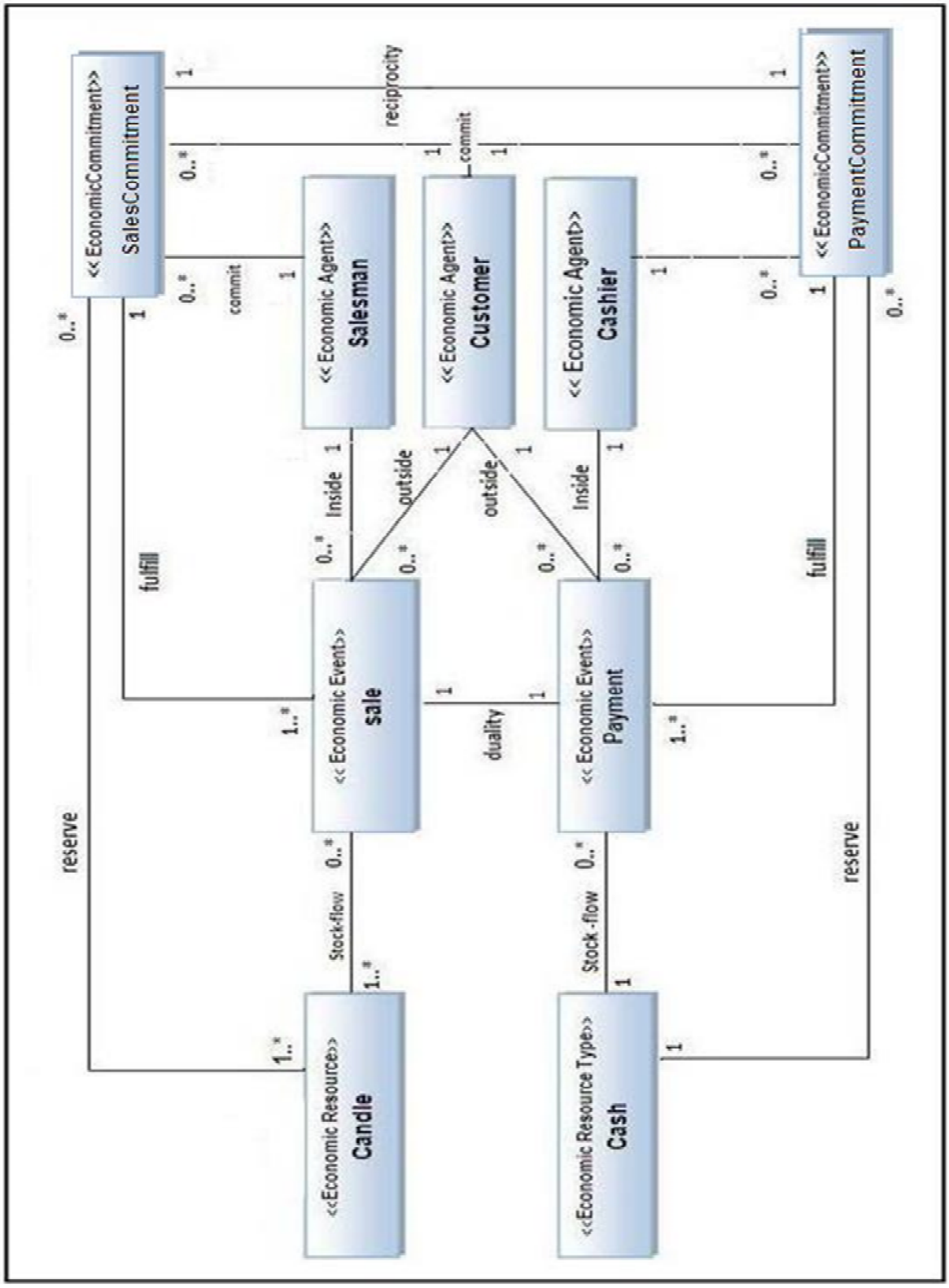


Figure 4.2: Sales Business Case Data Model

4.2 Data Modelling for the Management Process

The focus of this part is on data modeling for REA management process which is the result of REA business ontology has been created by Weigand. This part including planning and control framework, models the cybernetic rules for various management domains.

As mentioned in chapter 3, cybernetic management framework includes 4 PDCA-activities. Three types of Plan-, Check-, and Act-activity are within the management part which shall be studied in this chapter. Do-activity is in the business process activities described in the previous part through mentioning example on sales business case.

Having operational planning and control activities on one hand and transmitting messages relating these activities on the other hand is the positive point in MGT-activity diagram. These diagrams may be design in the form of closed loop management system or Open loop management systems.

When the activities that performed in business processes are controlled by Check-activity, the errors in the process are sent to Act-activity through deviation data object. In MGT-activity diagram there are 2 -closed loops: one with corrective nature which refers to business process and the other is in the form of adaptive to re-plan the system to the planning system.

As we said, MGT-activity diagram does not only include closed loop. Diagrams like figure 3.4 may also be displayed in the form of open loops as well. In each business case there are uncertain situations, which named stochastic environment .This environments can be measure in an open loop management process. In this type of system there is no Check-activity and the measured value is directly entered into the Act- activity without being compared with the performance standards.

Setting suitable adjustment of the business system with management system is the main problem of this discussion. There are various rules and policies for different business domains, and according the same suitable policies and rules shall be designed to management domains.

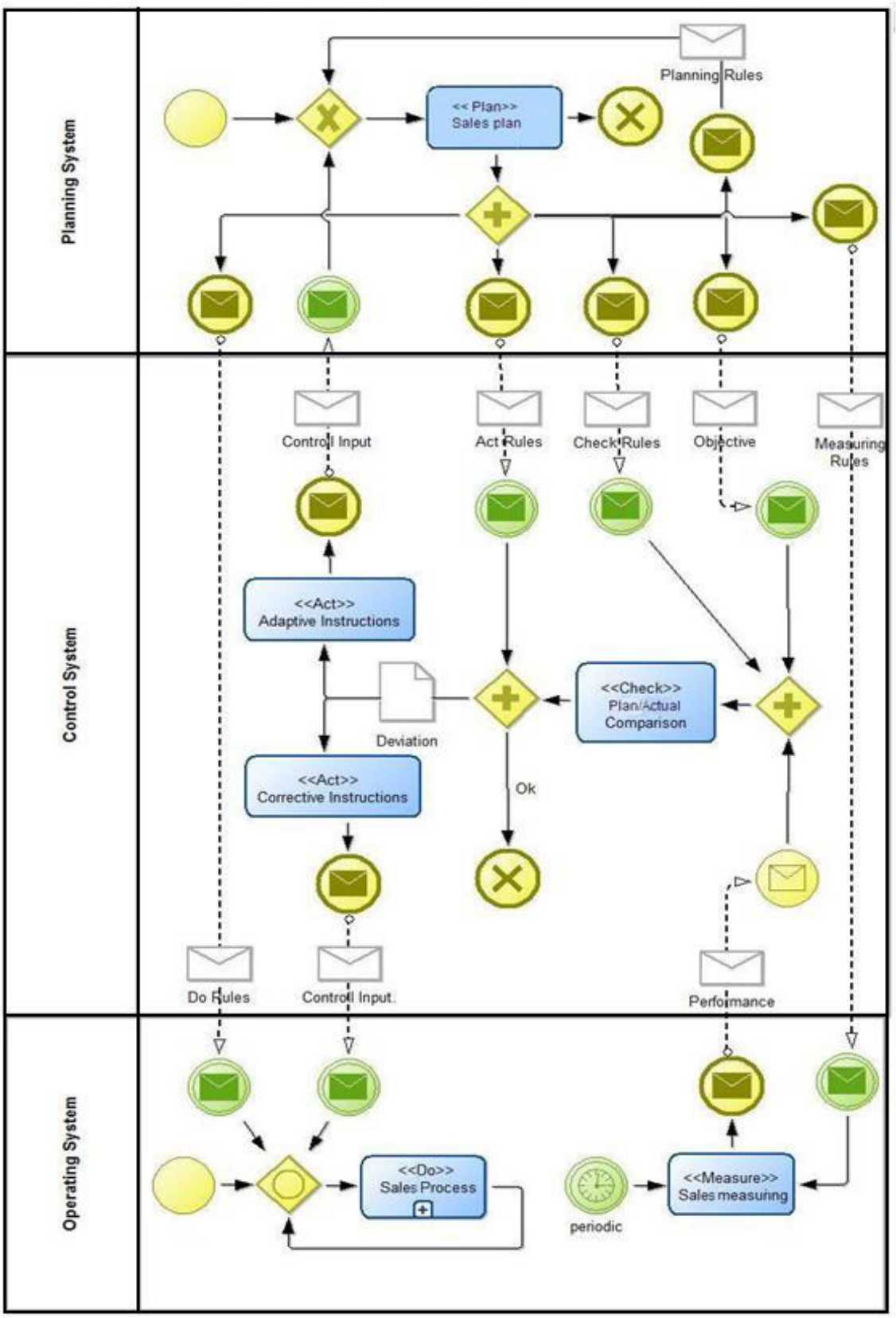


Figure 4.3: Closed Loop Management Process-Management-Activity Diagram

Some of the appropriate business policies may be used for the whole enterprise and be converted into business rules. Weigard has mentioned business policies in the following manner: “A group of intentional resources obeying the reciprocity principle.” [6.p.14] The same issue is also correct for the management policies.

4.2.1 REA Management Ontology

In the following figure, the business and management policies existed in the planning activity part have been shown. The business policy is in the form of operating rules (Do-Rules) and control policy including Check-, Act-, and Measure- rules with planning policy are grouped in the management policy. The control rules and measuring rules are in group of control policies. The Check-rules are use in closed loop systems and the Act-rules can be use in the open loop system. The future rules on the whole system shall be defined in Plan-rules.

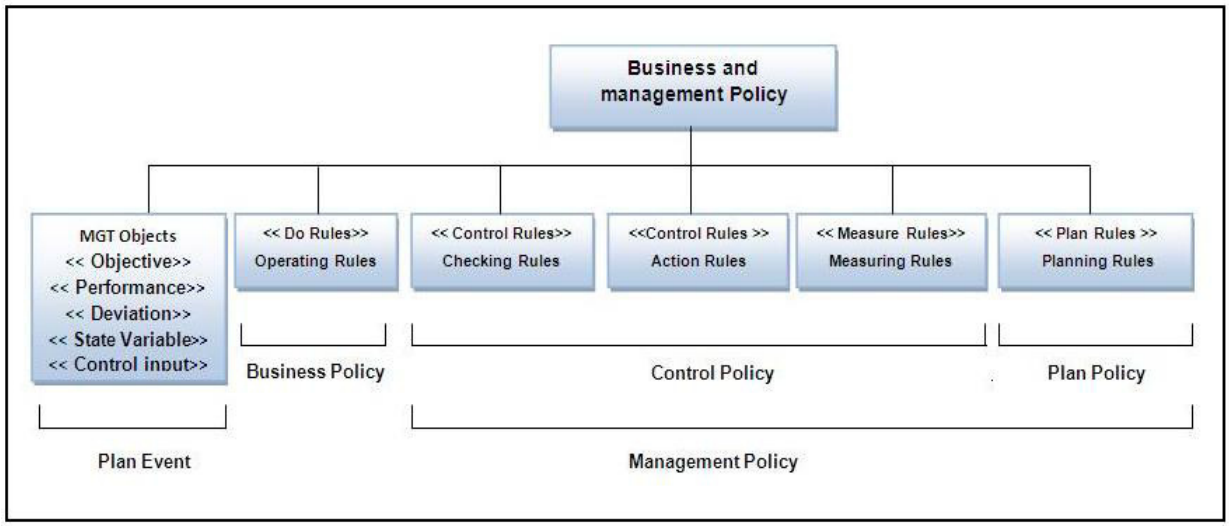


Figure 4.4: Business and Management Policy- Components [6.p.18]

The management activity diagram is one of the main modeling tools to indicate the business-, management policies for the different management domains. The REA management ontology needs these policies for the establishment. These policies in the REA management ontology are related to the cybernetic management processes and REA business processes. Policies may be generated between one event type and either one agent, agent type, resource, or resource type.

Probabilistic management system which is based on the probabilistic information may be examined in such ontology [6].

Plan Event and Risk Event are elements of the Probability Event Type. Plan Event includes certain factors which shall occur in the future and includes information available in the plan process. In their simplest form, they merely include a value for the certain future period.

As it may also be seen in the figure 4.5, the plan event is converted into a series of commitments after being designed by the manager. Such commitments are completed through time and after occurring economic events. [6.p.12]

Reciprocity has a similar role to the duality in Planning events, resulting in connecting the incrementing commitment with the decrementing commitments.

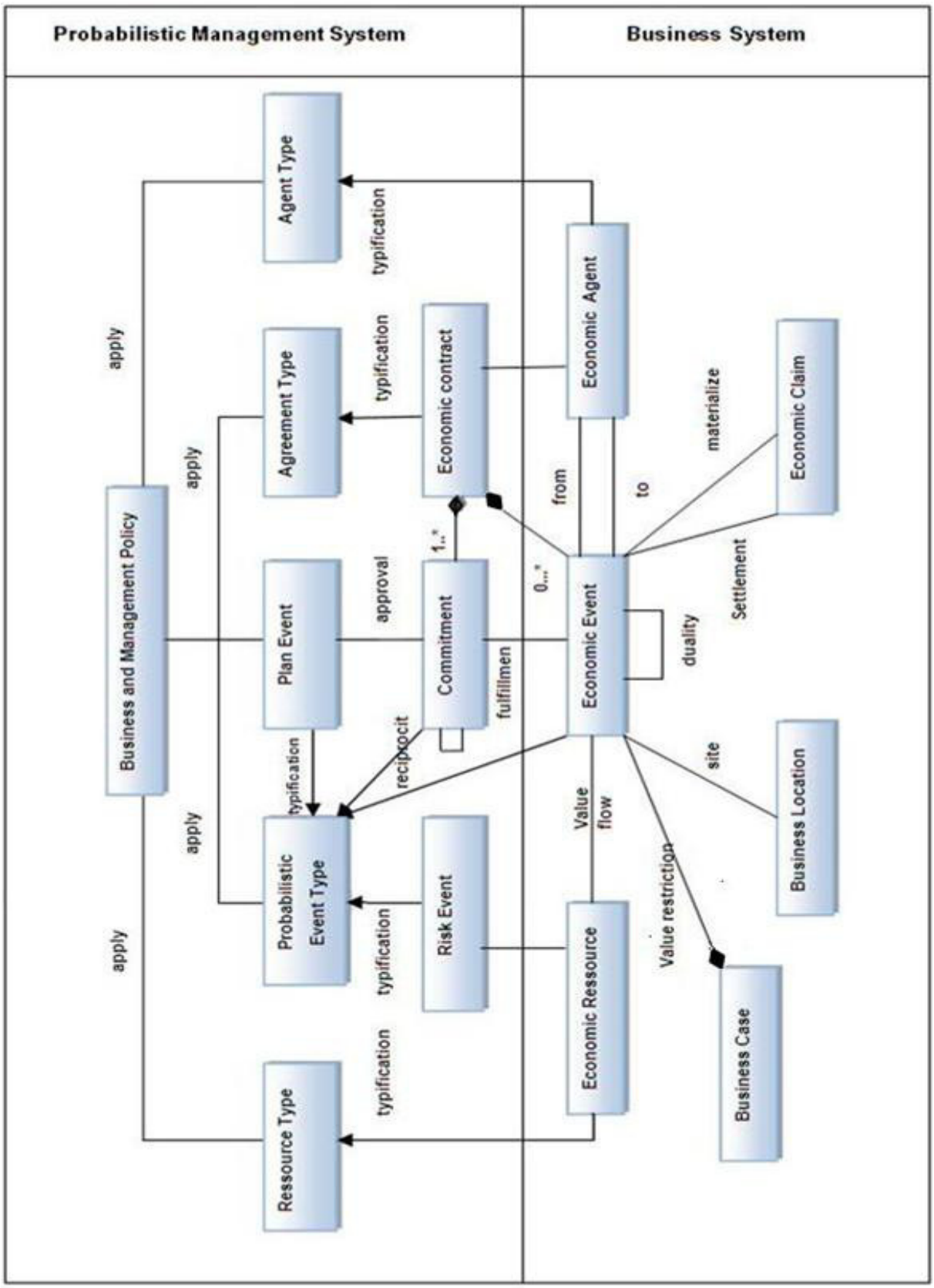


Figure 4.5: REA Management Ontology [6.p.19]

4.2.2 REA Management Information Base

REA management ontology has been developed through combining REA economic framework and cybernetic management framework. Such ontology includes business processes and management processes as well as the information among such processes. In the following figure, different process activities as well as information relevant to the same may be seen.

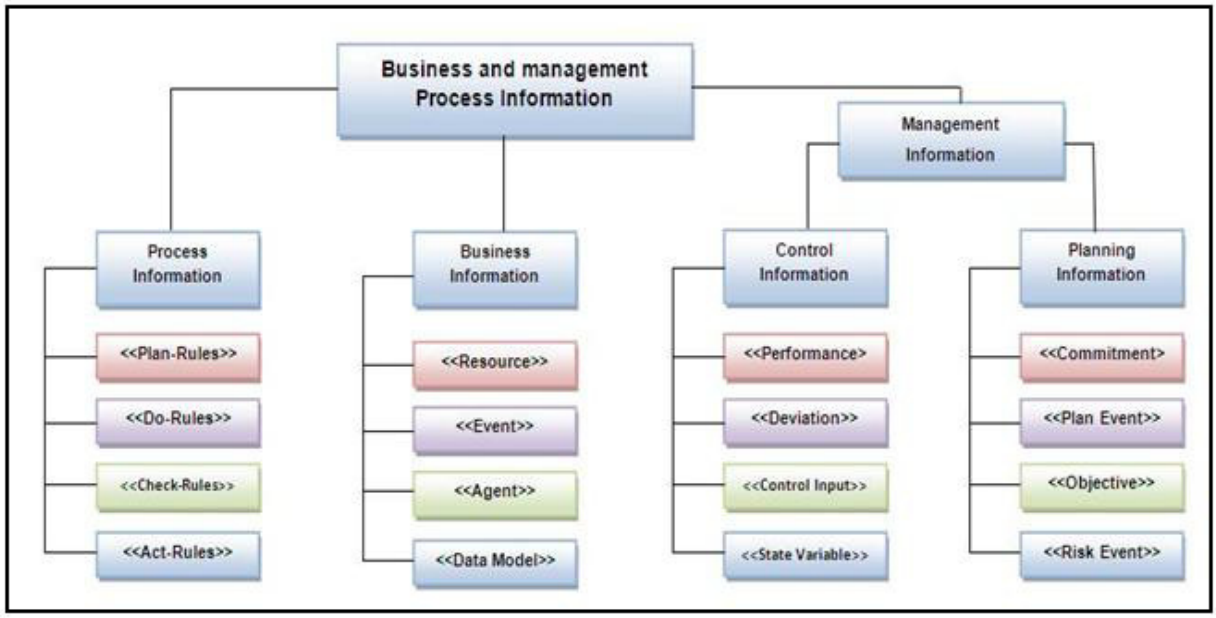


Figure4.6: REA Management Information Base [6.p.19]

Incidents and information generated within REA activity and management activity are classified into the following three main parts:

- Process Information,
- Business Information,
- Management Information.

Such procedure causes designing semantic integration principle in the field of business management. Data and information on business were studied in the previous parts.

4.2.3 PDCA Data Model

In the following figure, the information and data available in PDCA-activity for the management processes is modelled, considering figure 4.3. In Closed loop management process, there are many rules designed in the planning system part about Plan-, Measure-, Act- and Check- activities.

After implementation of the REA Business Process, the performance of the fulfilled process is measured by observing the measuring rules in check activity. The information obtained after such step compared with the pre-defined standards that are objectives, by check activity.

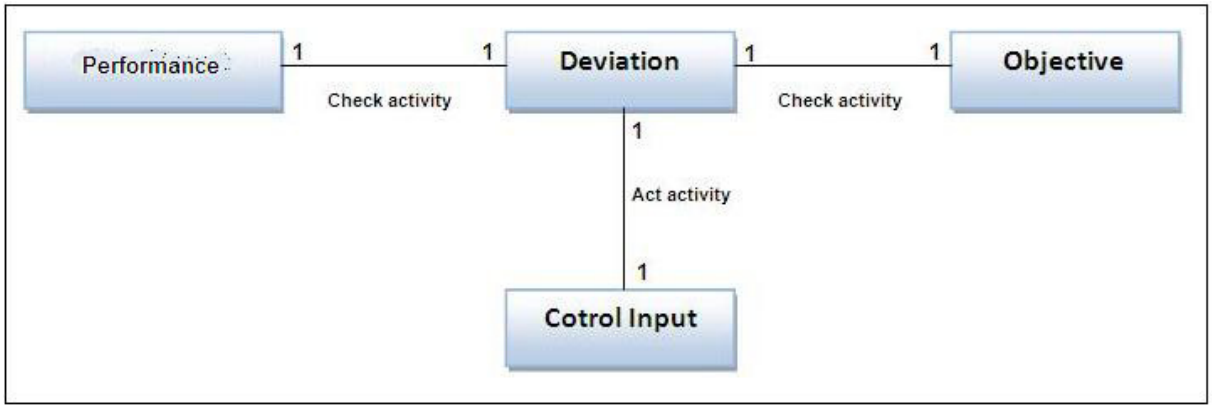


Figure4.7: PDCA Data Model

In case of any dispute, such information is stored in deviation. In the next step after comparing deviation with control rules, the reasons of occurrence of problems are sent to the Act activity.

Two types of control input are made from Act activity, one in the corrective form which returns to business process and prevent repetition of errors, and the other refers to the planning system adaptively and cause to re-plans the system. There is one to one association between all classes.

Through business management ontology the entire information components relevant to the REA activity diagram, information system shall be achieved. Such information helps us in designing semantic integration principle in the field of business and management. Through semantic integration, the contextual requirements may be interpreted into information system design. Management information system shall be

implementable to the modern information technology system. Considering the extensiveness of the information and processes in the management, business, and technical requirement fields, there is a need for framework that combines all such elements together.

Such framework shall also be able to interpret REA management ontology into information system. Zachman managed to design a framework such features. This framework includes three parts:

- User view,
- Designer view,
- Programmer view.

Whereas Zachman framework is a type of generic framework, it may be used for different contexts. After contextualizing the Accounting-base MGT information system to business MGT context, it may be used in Zachman framework.

REA management ontology after placing in the Zachman framework is converted into the form seen in the following figure. Such framework named REA management ontological design framework that has certain economic and cybernetic rules and may be implemented in the modern information technology.

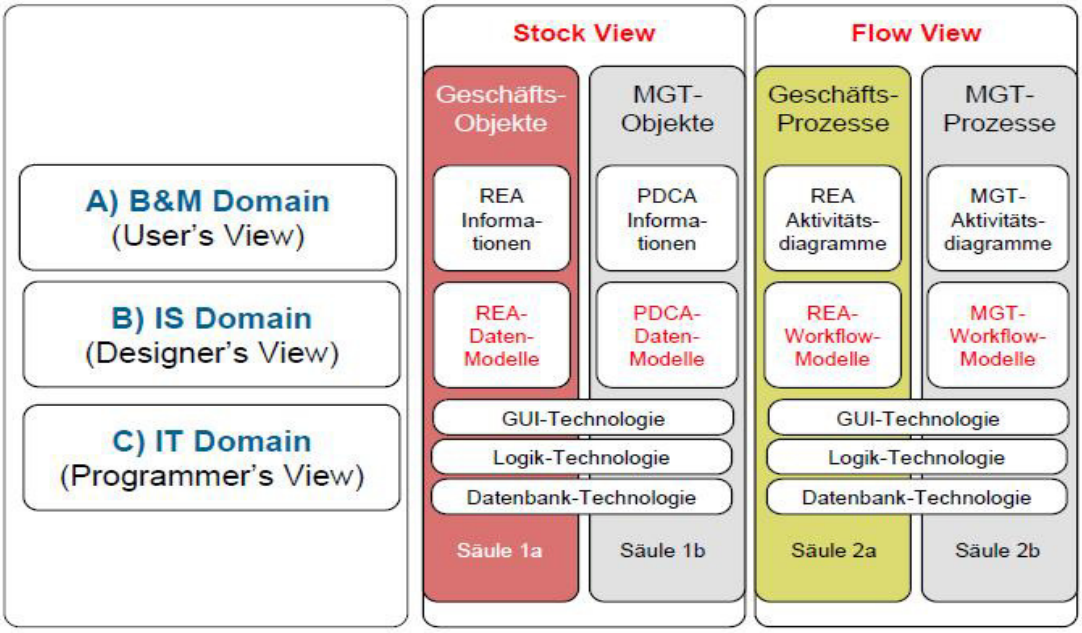


Figure4.8: REA Management Ontological Design Framework-Comprehensive Integration [6.p.20]

In the above figure, three composing layers REA management ontological design framework have been shown horizontally.

This framework has two architectural layers namely informational stock view and process oriented flow view. The importance of flow view and stock view in coordinated transmitting the information and processes is among three layers of user, designer, and programmer. In business stock part, the resources permanently in the system and the resources, which are changed, stored in the business flow part. In the management domain, the informational stock consists out of the management information in form of objectives, budgets, standards, actual values, deviations, and control inputs. This stock of information flows in the different activities of the management process where it is generated, processed and used as inputs.

The information and processes in the REA management ontology have been converted into data-, process model after being placed in the stock and flow view. The informational flows and the informational stocks are captured in the business model and data models.

In this chapter, the data existed in the designer's view has been modelled. In the next chapter we will focus on the database part existed in the programmer's view.

5 Prototypical implementation in MS Access

5.1 Overview

In each enterprise existent different business transactions with extensively data and processes which need to manage. Management information systems are adequate systems for recording the business transactions and monitoring the information flow of the transactions over time. Implementing of the management-, business processes and also information flow is an important point for this system that we fulfilled in last chapters. The REA model is one of the considerable and significant suggestions for the semantic modeling of management information system that was introduced by McCarthy. In this thesis the business and management logics are defined according REA ontology. At first, the business and management processes in sales management is modeled with help of Business Process Model and Notation2 (BPMN2) .In chapter 4 the adequate data model relevant to the processes has been modeled. Also the relations among the various data in part management ontology and business ontology were studied.

It is essential to have an adequate database structure, so that you can better and easily gain the exact information. The following chapter discusses the theories, approaches and implementations techniques of the sales management process to create a sufficient database. The databases include of a REA core model and provide the interface and the data structure.

First, we explain the principal concepts existed in the database. Knowing certain meanings such as properties and primary key for the REA concepts, such as resource, agent, and event commitment are important factors that help for implementation the REA model in database. Furthermore, the REA objects, such as agents, resources, and flows of these resources through different events will be implementing for business ontology and management ontology through specification of certain examples. There is a variety of programs to implement a database and we use Microsoft Office Access in this project. The MS Access database is a standard program that implements an uncomplicated database.

In this chapter, certain questions such as the following shall be answered:

- How REA diagrams defined for different deals of the organization are implemented in database?

The expression “Database” is one of the common concepts in the field of computer knowledge and technique. All those who are in a way involved in computer know it and each of them apply the same within the scope of their understanding and many enjoy knowledge or experience and specialty in this field.
Here we give an explanation, which seems to be the comprehensive definition existed in the academic and technical texts.
Database is a set of saved and persistent data in integrated manner (not always physically, but at least logically, linked and with the least redundancy as much as possible), under the management of a centralized control system, used by one or more user(s). Considering the definition, it may be understood that in terms of specialty viewpoint, each set of files is not essentially a database. There are certain concepts in the given definition that shall be understood correctly. [21]

Type of Existence

It refers to the general concept of an object, phenomenon and in general, whatever we tend to have information about, whether it is of physical or mental existence.
Usually type of existence has more than one feature and the user needs a set of information on it. Each existence has a name with known meaning.
Existence may be strong or independent, i.e. its existence is independent from any type of other existence and is automatically addressed in a certain environment. Weak existence of its nature shall then be dependent on another existence. In case strong existence is removed, then such type of existence shall also be removed.

Attribute

In fact, attribute is the feature of the type of existence and any type of existence has a set of attributes, which defines its state and situation. Each attribute has a certain name, type and meaning according to the users. [22]

Relationship

Relationship is a quite important concept in data semantic modeling. Usually there is relationship among the types of existence. Type of relationship is referred to interaction among “n” types of existence (n>=1), and naturally, it is a certain type of dependency on the type of existences. Each type of relationship has a certain semantic and is expressed using a name. The relationship between the REA ontology components e.g. Business case, events, resources and agents are generation’s hierarchies.

The Concept of Redundancy

Redundancy in a limited meaning is referring to repetition the saving of contents of fields in the database. Within the scope of database discussions, such concept has a more extensive meaning. In fact, redundancy here means repetition of data storing regarding the distinctive samples of one or more type(s) of an existence. Data saved in the database includes certain types of data with which the users deal on a daily basis. Such data are persistent, however, that does not mean that they are not changeable. Persistent here is referred to: management ontology business ontology data is durable in the system after running user program, resource, event, agent until an authorized user does not give the command for removal or changing the data, it will remain unchanged.[22]

5.2 Sales Business Process Implementation

After defining the general concepts of database, in this part we focus on implementation of tables for the main elements existed in REA-Ontology. In last chapter, the data and association among the REA elements such as resources, agents, and events are generally explains and studies. By taking benefit from such information merely, we shall not be able to generate table and are required to define properties and primary key as well. In the following, we define REA elements, i.e. resource and agent and explain examples to model the events occurred within the term of this project in the tables.

Economic Resource

Figure 5.1 shows a list of resources. The resources include elements such as products, service and money, which are from amongst the assets of the enterprise. Resources may be handled through a variety of events by which it may be increased or decreased.

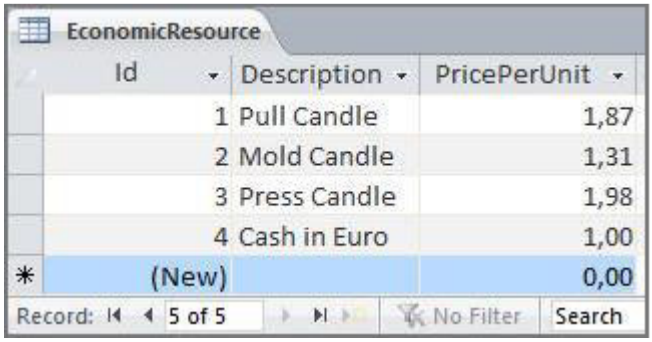


Figure 5.1: Resource Properties Table

In last figure, we have defined a main table for resources, namely EconomicResource, with general properties. Meanwhile, in property description, the important explanations on resource shall be mentioned. Value for each product is saving in PricePerUnit column.

Economic Agent

Agents may be classifying into two groups of inside-agent and outside-agent. Inside agents include seller, cashier and those involved in the production section and all the agents outside of the enterprise with whom the resources from the inside of the enterprise are exchanged are called outside agent, including but not limited to customer, bank, etc.

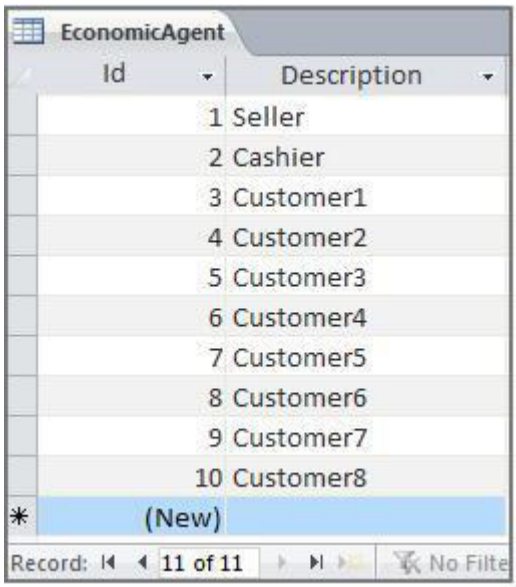


Figure 5.2: Agent Property Table

The following table includes information and attributes relevant to agents. General attributes relating to the agent are stored in EconomicAgent table. In property description; the explanations about agents shall be mentioned.

5.2.1 CashSales Process

The menu structure of the cash sales process is illustrated in figure 5.3. There are the function categories are visible. In CashSales menu, the information about selling resources are stored; such resources may be products or services handled among agents, e.g. customer and enterprise employee. Each customer can buy resources that are available in the enterprise and pay for her purchase. There are different fields in the form such as a list of resources, agents. In each sales process, resources and agents must be choosing from the dropdown box. This way it can be intend in the system, which economic resources are exchanged in economic events between economic agents.

The tables are filled from the fields included in the form using VBA, which executes classic SQL statements. All tables are filled with standard "**INSERT INTO**" SQL statements and the values are extracted from the form fields or relevant tables. Execution of SQL statments is triggered by "**DoCmd.RunSQL**". First the values from

the inputs are read, stored inside the VBA code and then inserted into relevant tables by combining them with "INSERT INTO" statements -> creating a string by concatenating text with values stored in variables. Additional code parts used are **DoCmd.SetWarnings False**, which turns off the messages. At the end, they are turned on back by **DoCmd.SetWarnings True**. In addition, the dates have to convert into native access date in the form **#mm/dd/yyy#.** This also happens by simple string manipulation at the beginning of the code execution when defining variables. Meanwhile, access VBA functions **DMAX** and **DLOOKUP** are used returning the maximum value from a table in case of DMAX or a specific value from a table in case of DLOOKUP. **MsgBox** at the end informs about completion of the code processing.

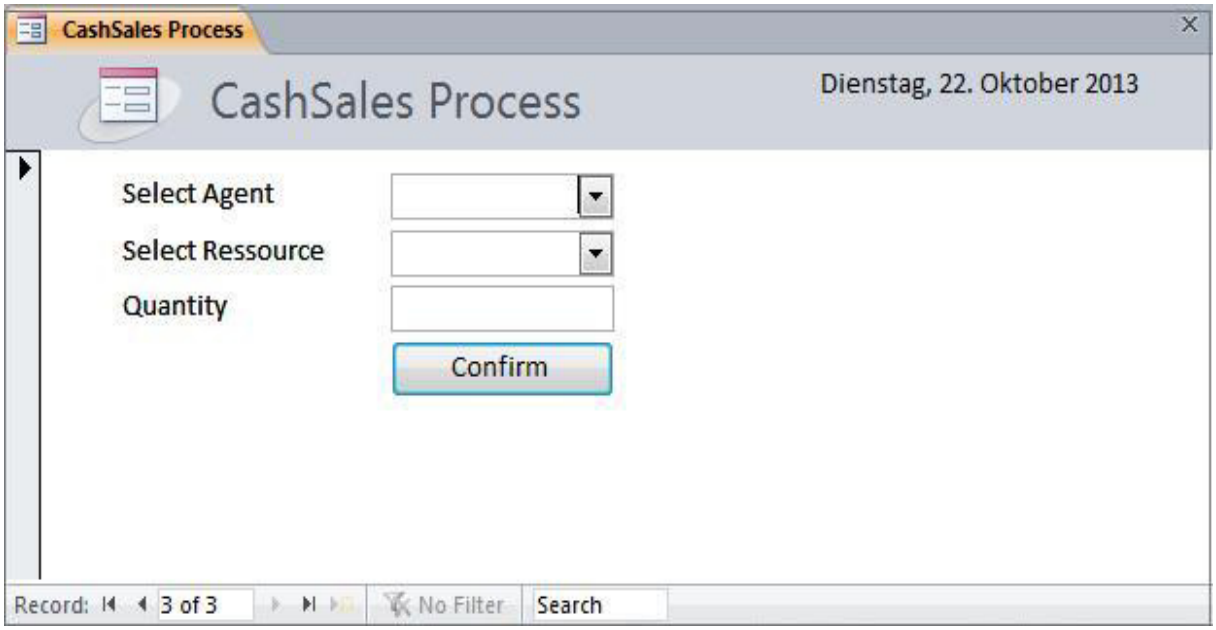


Figure 5.3: CashSales Menu

5.2.1.1 Material Flow

In our examples, the resources are candles and sales process causes a decrease in the number of the same in the enterprise. This table includes a variety of columns including but not limited to Id, which is a primary key. In the MaterialFlow table, sailed resources in form of Pull candle (EconomicResourceId= 1), Mold candle (EconomicResourceId = 2) and Press candle (EconomicResourceId = 3) with quantity and value is recorded. The quantity of sailed resources is stored in Quantity

column and the value of them in Value column. The EventId refers the event that each material flow belongs to it.

MaterialFlow

Id	Description	Quantity	Value	EconomicResourceId	EventId
1	Pull Candle Flow	88.896	166.235 €	1	1
2	Mold Candle Flow	67.898	88.267 €	2	1
3	Press Candle Flow	14.761	29.226 €	3	1

Record: 6 of 6 No Filter Search

Figure 5.4: MaterialFlow table

5.2.1.2 Financial Flow

In this part, we focus on the table relating to the payment process. Occurrence of this event may increase or decrease the financial resources. Such events may happen among different agents. For instance, in case payment occurs between customer and seller agents, then it causes the customer to pay for an amount of money to purchase candle. This issue results in an increment the resource cash in the enterprise.

In the FinancialFlow table, Id column has been considered as primary key and in the next column known as description, the explanations about transferred resource are written. The prices of sold candles in Quantity and Value columns are recorded. The values in these two columns can be writing from the sum of value in MateriaFlow table. In other column, Id of economic resource which inflowing in the enterprise can be seeing. The value in EventId column is two, which shows the payments event and has association with EconomicEvent table.

FinancialFlow

Id	Description	Quantitiy	Value	CashId	EventId
1	Cash Flow	283728	283.728,00 €	4	2
(New)					

Record: 2 of 2 No Filter Search

Figure 5.5: FinancialFlow table

On the other hand, event payment (in case occurs to pay salary of employees or purchase materials required for the enterprise) results in a decrement resource cash in the enterprise.

5.2.1.3 EconomicEvent

A list of economic events is illustrated in figure 5.6. In this example there is sale-, payment events that describes the flow of resources (Candle, Cash).It attending at list two events in each business case. Each event shall be associated with other event while such association is maked through duality and fulfilment association.

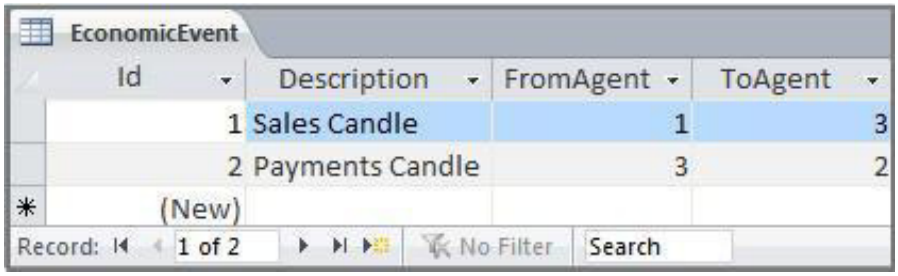


Figure 5.6: Economic Event

For the economic event is a table created with defining properties (Id as primary key and FromAgent, ToAgent as foreign key). In description column, the name of each event is written. The outflow of a resource displays in FromAgent and the incoming of resource in ToAgent. For example sales event with id one, explains the flow of the resource candle through sales event from seller with agent id one to customer with agent id tree.

5.2.1.4 Business Case

In the REA-Ontology each event belongs to an entity set. This principle named duality and explains that each event in increment entity set has a relation with the corresponding decrement entity set.

This table shows an equivalent resource flow opposite. Payment and sale are two events, and shall be relating with another through duality principle, therefore we need columns for the issue of them. In this case, one event cause to decrement resources in the enterprise and the other increment it. In this business case, sales event with id one which is issue by the customer, decrements resources and is save in column DecrementEventId. Therefore, in this column, the Id of sales event, from EconomicEvent table is writing. The other one is payment event and cause to

incoming equal quantity of resources cash in the system. It is written in IncrementEventId with id two.

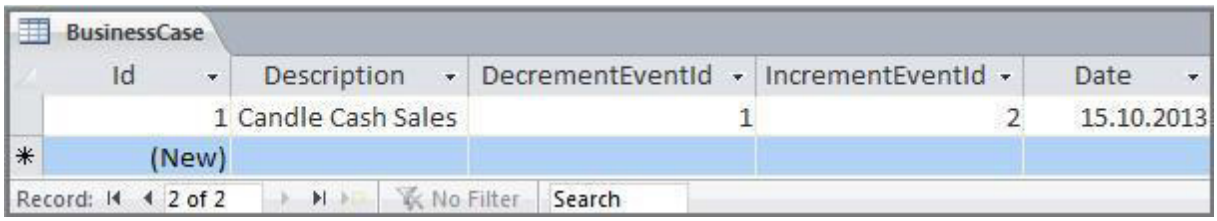


Figure 5.7: Business Case

5.2.2 Order Process

In the following menu, information, which occurs in the order process, has been showing. Sometimes, we receive orders from the customer due to which a quantity of resources for a certain period is reserved. Such orders that the customer issue, cause a decrease in the resources of the enterprise. On the other hand, in case such order is given by the enterprise to the supplier to purchase materials and/or products, generates increase the resources in the enterprise. In this example the money that will be paying in the future, give rise to increase the resource.

This form works in the same way to CashSales Process form. All the information will be enter in to the tables, after confirming it. Consequently, after each confirmation, also two new events will be added in the Commitment table, one sale commit and the other payments commit. Reciprocity association between events will be stored in Order table.

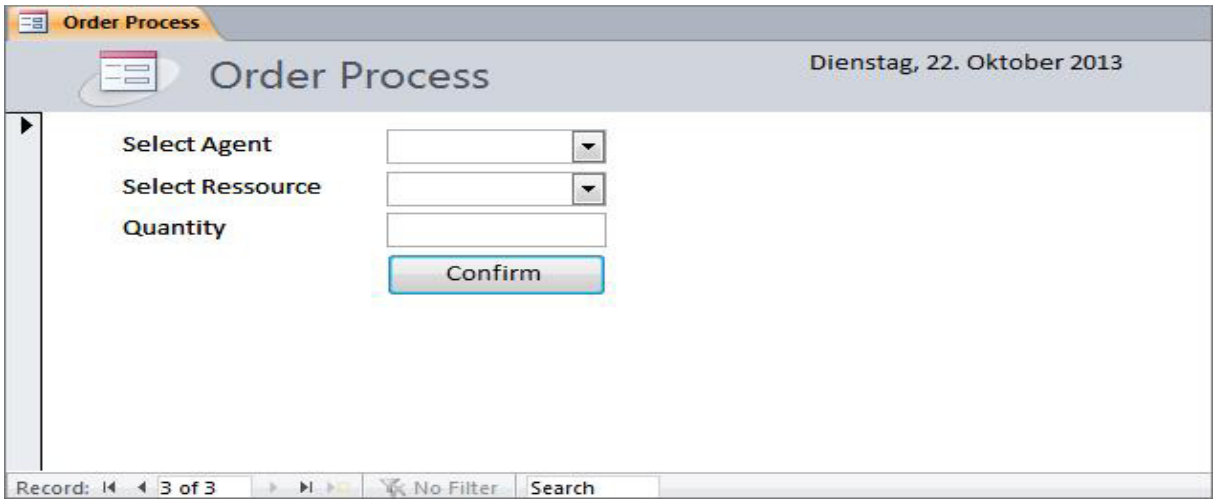
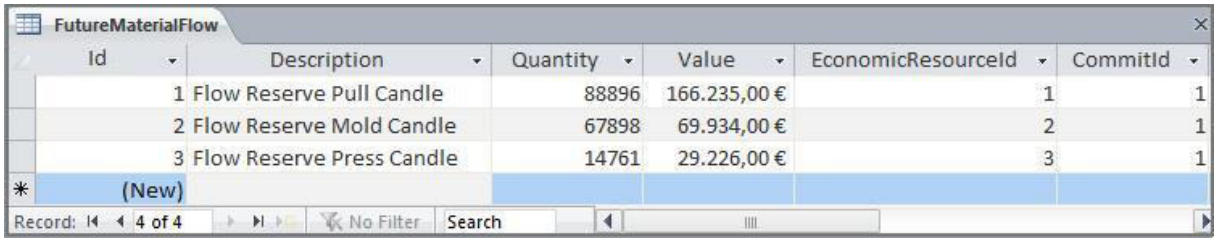


Figure 5.8: Order Process Menu

5.2.2.1 Future Material Flow

In this table, orders resources in form of PullCandle (EconomicResourceId= 1), MoldCandle (EconomicResourceId = 2) and PressCandle (EconomicResourceId = 3) with quantity and value is recorded. In next column, the quantity of ordered candles is stored and the value of them in Value column. The value in CommitId column shows the association of this table with Commitment table.



FutureMaterialFlow

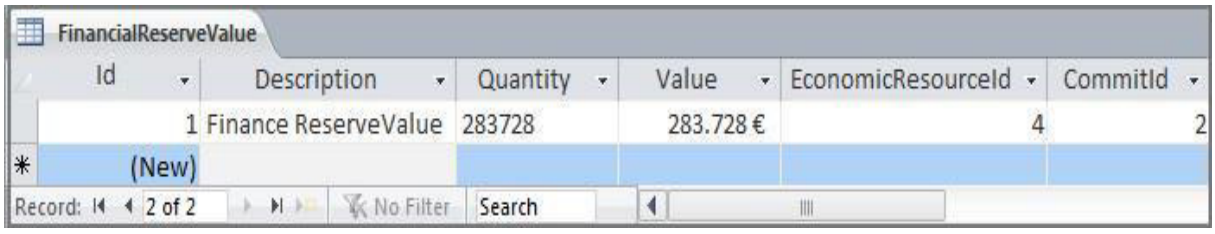
Id	Description	Quantity	Value	EconomicResourceId	CommitId
1	Flow Reserve Pull Candle	88896	166.235,00 €	1	1
2	Flow Reserve Mold Candle	67898	69.934,00 €	2	1
3	Flow Reserve Press Candle	14761	29.226,00 €	3	1
(New)					

Record: 4 of 4 No Filter Search

Figure 5.9: Future Material Flow Table

5.2.2.2 Financial Reserve Value

In Financial reserve value table, the equal value of ordered resource will be saving. New Id is used in cases when we have received an order from the customer. Sometimes the customer pays an amount as advance payment against her order, while such resource shall be reserve in the system, or we may pay a certain amount of money against the order we place to purchase a certain good.



FinancialReserveValue

Id	Description	Quantity	Value	EconomicResourceId	CommitId
1	Finance ReserveValue	283728	283.728 €	4	2
(New)					

Record: 2 of 2 No Filter Search

Figure 5.10: Finance Reserve Value Table

5.2.2.3 Commitment

There is another kind of events that happens in future, such as order product from customer or production plans. Whereas such event occurs in the future, we use concepts other than duality to establish associations among them. In this part, we briefly explain one of them:

- Commitment is one of the most important elements existed in the planning view, by which it may be specified which inside agent or outside agent is going to be committed for the events to be occurred in the future. In fact, in economic commitment, the rules and policies to be written and implemented in a contract shall be written.

The commitment table introduced which events haves happen. In an event the control over resources is by Agents, which they can transform or transfer resources. Next two columns explain that, which agent exchange resource in an event. The first date is about the order date and in the next one the delivery date can be written.
When each two commitments are fulfilled, the rules among them are converted from reciprocity to duality principle. All the rules are defined and implemented within such steps, shall be stored and kept in economic contract.

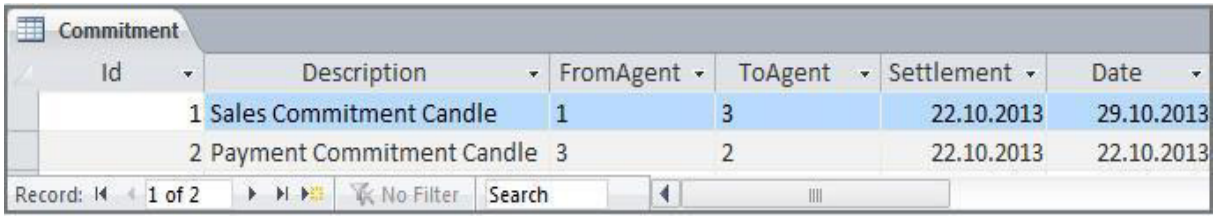


Figure 5.11: Commitment table

5.2.2.4 Order

According to the REA ontology, one of the core concepts is commitments association. It causes to connect two different commitments that happen in the future, a decrement commitment with a related increment commitment.

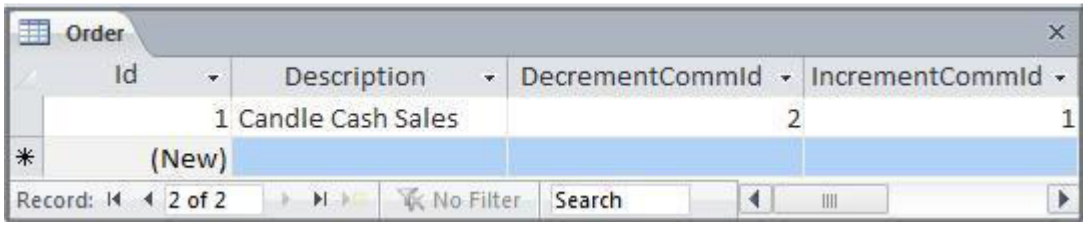


Figure 5.12: Order table

In a commitment the quantity and value of resources might be decremented by using or giving the resource or incremented, when we take a resource. In other properties,

including but not limited to description, the explanations relevant to the transmission of resources among agents are mentioned.

5.3 Management Process Implementation

The planning and controlling of the business processes such as sale, payment are a development of the REA model. In this system there are two strategies for planning and controlling. One of them is about plan and control future sales quantity. The other one plans the revenue for next year.

Implementation for the REA Management Ontology

One of the most important events that shall be defining within the various processes is planning and control events. In this part, plan and control, which we define for other events such as sale and payment, are specified. In addition, other tables such as SalesManagementInfo and RevenuemanagementInfo shall be defined to store rules and policies required for each economic event that are associated with objective and performance tables. Planning event is from amongst certain events in the field of management and together with the control event, highly help in correct planning and controlling certain events such as sale.

The policies, rules, and standards that shall be observing between agent and resources upon economic event are stored in Objective-, Performance-, Management Information tables.

Such rules and standards help us in controlling the planning had made for different processes, e.g. sales, payment. In this project we defining two different police, one of them is about the quantity of sailed resource in last year, which is located in the Sales management Information section and the other is about the value of sailed resource that is in Revenue management Information table. We can answer such questions easier. In case of existence deviation, what is the value and with which rule or policy they may be, solves? In the following, we explain these two methods with the same example.

5.3.1 Sales Management

In the following figure, the menu structure of management information is illustrated. By selecting the id of one economic resource, the manager can be seen the deviation and the related control policies about quantity and value of sailed resources during last year. In order to design sales management information, there shall exist at least one resource.

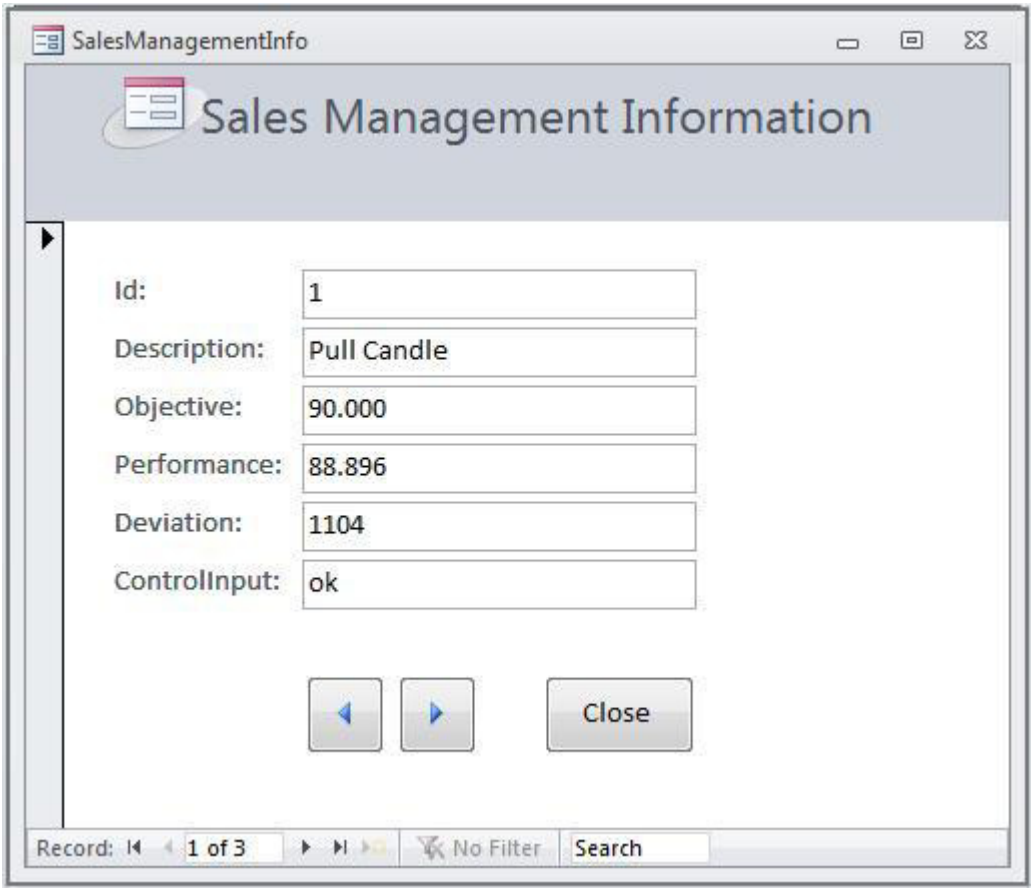


Figure 5.11: Sales Management Information Menu

5.3.1.1 Sales Objective

In this table the information about quantity of plan sales in the future is saved. Plan about the quantity can be monthly, quarterly or yearly. The plan value that place in column objective and Horizon column which is in this example yearly. These values are depended on the management and controlling policies of the enterprise. EconomicResourceId is a foreign key and cause an association between this table

and EconomicResource table. The units of measurement (UOM) related to quantity of sales candle is Kg.

SalesObjective

Id	Description	EconomicResourceId	Horizon	Objective	UOM
1	Sales Objective	1	Y	90.000	Kg
2	Sales Objective	2	Y	65.000	Kg
3	Sales Objective	3	Y	17.785	Kg
(New)				0	

Record: 4 of 4 No Filter Search

Figure 5.12: Sales Objective table

5.3.1.2 Sales Performance

The performance tables are quite similar to the objective tables. While the objective table defines what will happen in the future and the performance describes that has happened.

The quantity of sales candle in last year can be saving in this table. The value of sales performance for each resource is in column performance which comes from material flow table. There is also horizon as well as unit of measuring.

SalesPerformance

Id	Description	EconomicResourceId	Horizon	Performance	UOM
1	Sales Performance	1	Y	88.896	Kg
2	Sales Performance	2	Y	67.898	Kg
3	Sales Performance	3	Y	14.761	Kg

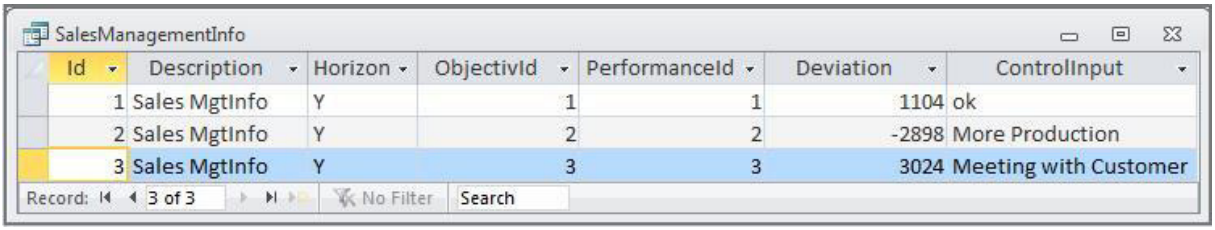
Record: 3 of 3 No Filter Search

Figure 5.13: Sales Performance table

5.3.1.3 Sales Management Information

Planning event is from amongst certain events in the field of management and together with the control event, they highly help in correct planning and controlling certain events such as sale. In table, SalesManagementInfo shall be defining to store rules and policies required for each economic event that are associated with Objective-, Performance tables. All the controlling decision about each resource is saved in ControllInput column that is directly relates to Deviation values. For

example, for resource pull candle the objective value is 90.000 kg and the performance value 88.896 kg. By decreasing these two factors, we can calculate the value of deviation which is 1104.



SalesManagementInfo

Id	Description	Horizon	ObjectivId	PerformanceId	Deviation	ControlInput
1	Sales MgtInfo	Y	1	1	1104	ok
2	Sales MgtInfo	Y	2	2	-2898	More Production
3	Sales MgtInfo	Y	3	3	3024	Meeting with Customer

Record: 3 of 3 No Filter Search

Figure 5.14: Sales Management Information

The policies that defines for deviations in the control Input column would be look like this:

Policy 1: If the deviation < zero than more production. That means we have sailed in last year more than plan value.

Policy 2: If the deviation < 2000 than is Ok. We don't need to do something because the value of deviation is not too high.

Policy 3: If the deviation > 2000 than meeting with customer. That means we have sailed in last year less than plan value. For solving this problem we need to know market needs and changes.

5.3.2 Revenue management

The screenshot of the start page of Revenue Management Information shows in the next figure. This menu consists of all reports about revenue value in last year that have been saved in another tables such as Revenueobjective, Revenueperformance and RevenueManagementInfo. The structure of this form is as follow: at first, the Id of sailed resource, in the next fields, the name of sailed resource and the period of these sales. Other information related to this Id such as Objective, which represents the objective value, performance that represents the value of sailed candle in last year can be seen. The Deviation and ControlInput values are most important part in this menu. The difference between Objective and performance is saved in Deviation field and represents how much the manager is successful with his plan. In the next

field, polices related with each deviation can be seen. At the end of the page, the commands related to this part are located.

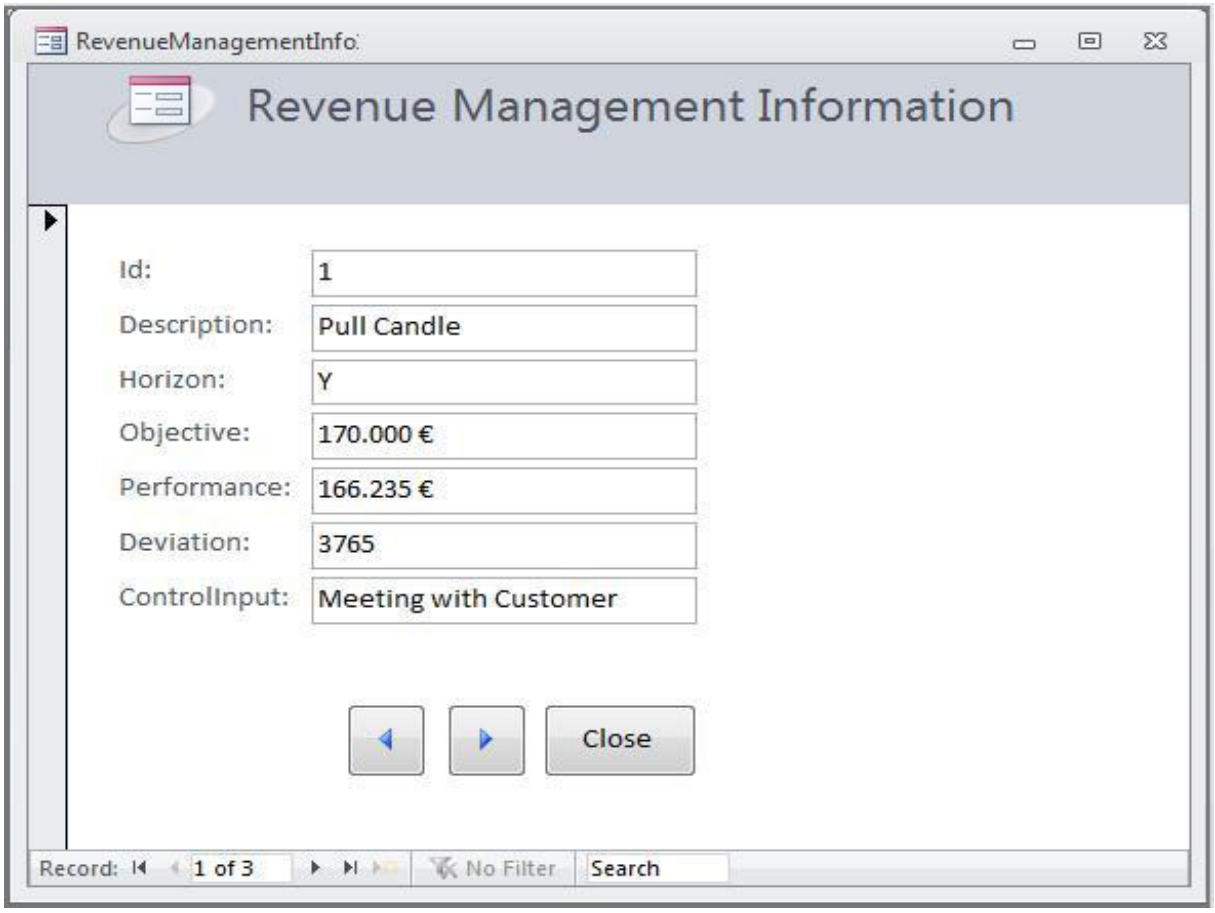


Figure 5.15: Revenue Management Information Menu

5.3.2.1 Revenue Objective

Figure 5.16 illustrates the revenue objective. Similar to sales objective the description and value of revenue as well as horizon and units of measurement (UOM), that heir euro is can be find. In this case in objective column the plan value of each resource for next year will be saving.

RevenueObjective

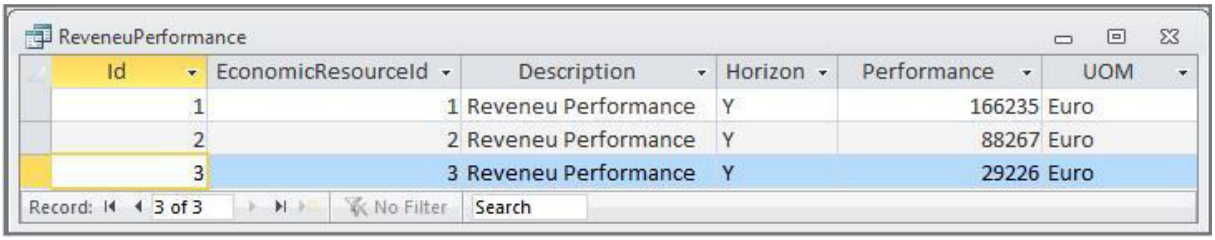
Id	Description	EconomicResourceId	Horizon	Objective	UOM
1	Reveneu Objective	1	Y	170.000	Euro
2	Reveneu Objective	2	Y	80.000	Euro
3	Reveneu Objective	3	Y	30.000	Euro
(New)				0	

Record: 4 of 4 No Filter Search

Figure 5.16: Revenue Objective table

5.3.2.2 Revenue Performance

In this table the current value of resource for sale in last year and EconomicResourceId as well as Horizon and unit of measuring illustrates. The value of performance column comes out of MaterialFlow table. By changes in the value of sales resource in MaterialFlow table, it is visible at current time in this column.


ReveneuPerformance

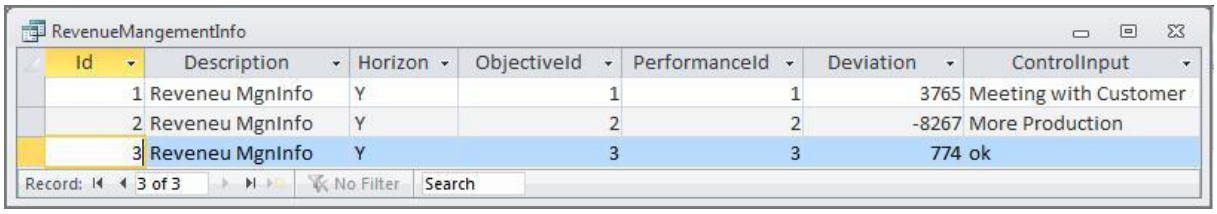
Id	EconomicResourceId	Description	Horizon	Performance	UOM
1	1	Reveneu Performance	Y	166235	Euro
2	2	Reveneu Performance	Y	88267	Euro
3	3	Reveneu Performance	Y	29226	Euro

Record: 3 of 3 No Filter Search

Figure 5.17: Revenue Performance table

5.3.2.3 Revenue Management Information

In this table the value of objective and performance can be compaired together.The difference between them can be save in deviation column. There is also different policies relating to deviation values and saved in controlInput column. The definition of policies is not similar to comtrol inputs values in the SalesManagement Info table. For example, when deviation value > 2000, that means we have sallied more than plan value and we can have more production in next year. In order to define more complex policies, we need to have a policies view ,that is out of focus of this project.


RevenueMangementInfo

Id	Description	Horizon	ObjectiveId	PerformanceId	Deviation	ControlInput
1	Reveneu MgnInfo	Y	1	1	3765	Meeting with Customer
2	Reveneu MgnInfo	Y	2	2	-8267	More Production
3	Reveneu MgnInfo	Y	3	3	774	ok

Record: 3 of 3 No Filter Search

Figure 5.18: Revenue Management Information table

6 Conclusion

In recent years, several investigations and progresses have been made in the field of business; however, in order to manage all such processes, we do not have sufficient resources and information. The purpose of this study was to examine the data and processes in the field of sales management discussion through presenting an example (candle EWF).

In the early part, we focused on modelling the processes relevant to sales management in the BPMN2 program and explained the concepts available in PDCA- Framework. In the further parts, sales management was studied in terms of REA Ontology and modelled the existed data of the sales process in two fields, management, and business. This structure, called REA Management Ontological Decision Framework, is based on REA Management Ontology. Such ontology has been formed because of advancement in REA Accounting and Business Ontology as well as rules and standard available in the cybernetic principle. The data relating to the sales was modelled by using MGT activity diagram, REA activity diagram where policy infrastructure and information relevant to the business, management was also effective.

In fact, designing the REA Management Ontology Framework relates to the Zachman Framework, where information system architecture has been classified into two parts of management and business. As also mentioned earlier, in previous chapters we studied the first two layers of Zachman Framework, i.e. view of user and designer, and in chapter we focused on planning and control as well as available data four by using statistical concepts. In last chapter, the relevant data in business as well as managements concepts was implemented in the Microsoft Access applications.

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