Improving The Decisional Process By Using UML Diagrams

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In the last years, the world has moved from predominantly industrial society to information society, governed by a new set of rules, which allows access to digital technologies, processing, storage and transmission of information. Organizations include in their decisional process Business Intelligence components, which help the decision-makers to establish the conditions of financial equilibrium, to highlight weaknesses and strengths, to make predictions. Particularly, Unified Modelling Language (UML), as a formal and standardized language, allows the control of the system's complexity, shows different but complementary views of the organization and ensures independence towards the implementation language and the domain of application.

This article aims to show the way UML diagrams are used as support in a decisional process for a hotel company. UML diagrams designed help decision-makers to analysis and discover the causes, to design and simulation of possible scenarios, to implement and measuring the results.

Keywords: Unified Modelling Language, Business Intelligence components, decisional process, diagrams, scenarios, model, structure, behavior.
General considerations

Organizations are components of a global system and have to develop efficient activities that allow them to become competitive. Their decisional process involves the *data collections* and the *access instruments* (applications, procedures or functions) to manage them.

In order to substantiate decisions, we efficiently define *data collections*, bringing together different data, analyzing and interpreting a large volume of information, trying to reduce uncertainty, leading to recommendations and variants in the future actions. Depending of the organization’s particularities and according to a defined purpose, decision-makers manage data grouped on topics of analysis, solve problems regarding economic situation, the conditions of financial equilibrium, highlight weaknesses and strengths, make predictions.

The *access instruments* include: reporting applications that access data using SQL language, application based on OLAP technology and application based on data-mining technology. All of them provide facilities to order, summarize or calculate intermediate data, offer tools for simulation after user-defined scenarios.

Taken advantages from the progress in science computer, the new business environment integrates into traditional informatics systems the components of “business intelligence”. The term focuses on the informatics tools which bring a plus of intelligence in business process. Through them, an organization extends the way to conduct its business, enables computer-assisted management and increases efficiency of application decisions.

Business Intelligence components divides the users in: (1) users of information who need reports and performance indicators; (2) consumers of information, those who require analysis of information and dynamic query of data; (3) analyst and experts who should have free access to any information and make multidimensional data analysis, analysis in a real time. Likewise, they group data collections used in: (1) standard information, used for person with operational tasks, who process daily transactions; (2) data collection for analysis, including reports on progress of a process or business efficiency analysis; (3) data collections defined for a particular decisions, that bring together data from different programming environment regarding the same purpose (data warehouses).

As a Business Intelligence component, Unified Modelling Language
(UML) supports object oriented representation of the entities defined in organization and allows the design of a model that can be analyzed by theoretical approach. The conclusions are extrapolated to the real system and lead to the improvement of the activities in organization.

With the recognition of UML as a standard language for modeling, the process of decision becomes a technique for coordinating computer-aided experiments and UML diagrams become universal visual tools for modeling elements. Each diagram is designed in a certain moment, shows a certain aspect of the modeled system and has a certain utility for the model. Furthermore, the same diagram can be designed in different moment, showing different aspect. For example, activity diagram can be designed to detail a use case for use case diagram or can develop an algorithm from a class's method.

**The UML diagrams in the decisional process**

In the decisional process, we have several situation in which we can design UML diagrams: (1) to obtain a model of activities performed in the organization; (2) to emphasize the consistency between diagrams designed; (3) to manage the persistent objects; (4) to highlight the problems that need to be solved and the environment where they are identified; (5) to organize the interface with the users; (6) to decide the objects’ reusability.

As a graphical notation, the diagrams allow visual expression of an object solution and its notation limits ambiguity. The models obtained during different stages are represented by different types of diagrams, which are linked by relations determined by the context. In successive stages, each model brings a different view on the system, adds new elements to the previous model, until, finally, we have a general view regarding the system.

The usual diagrams used in the decisional process are: *use case diagram, class diagram, sequence diagram, state diagram and activity diagram.*

- *Use case diagram* highlights the functionality of the system designed for improving the performances of the organization. In this diagram, the decision-makers show the actors and the activities they coordinate, organize the users’ demands, taken into account the employees from the organization.

- *Class diagram* shows the static structure of the organization, includes entities with attributes and operations. In the decisional process it represents the only implementable model, the single view in which the decision-makers can see the structure of data related with the access instruments.
• **Sequence diagram** is designed for a use case scenario and take into account that there is no a single criteria for decision, the results depending on different factors. This diagram shows the exchange of messages between the objects identified in the organization. The designers emphasize the sequence in time of messages and take care that the messages will be included in the class diagram, as operation for the receiver class. Depending on different conditions, we could show different messages trigged by an object, different messages received from the same object, or we can evidence the new objects created.

• **State diagram** is designed for a dynamic class and shows the changes of state brought about by events received by class. This is a real help for decision-makers, because offer a view of the relationship between the cause and the effect, between the events and the consequences of their actions. Furthermore, the procedures and functions are divided in internal actions and external actions which can be seen by other class objects. This has helpful consequences in static and dynamic inheritance, in reuse process.

• **Activity diagram** is the most important diagram in the decisional process, because it shows the decisional moment through the decisional block and alternative processes. Attached to a use case diagram, decision-makers can evidence the sequence of the activities analyzed, the moment when it necessary to take a decision and the sequences of activities after the decision was taken. Attached to a method from a class, the activity diagram can detail a method's algorithms, can evidence the decisional moment in the cod sequences.

In every moment, the decision-makers can consult all these diagrams, in order to have brief, accurate and understandable model of the real system, to seize where and when you have to act in order to remedy deficiencies.

**The UML diagrams designed for improving the activity in a hotel company**

We present below how the UML diagrams participate in the design of models which represent the basis in the process of assisting the decisions, in a hotel where we want to improve the reservation process.

Before designing the diagrams, we enounce the business rules and we define the table of event for booking process.
The business rules

The business rules, enounced in a way we could highlight the actors and the activities triggered by them are:

- The client can book a room or more by phone, on-line or at the hotel. Client can be a person or a judicial person.
- The booking process will be manage by an employee from the hotel.
- The employee checks if the room is available. After validation, the client will complete the form for booking.
- Before he leaves, the client will complete a form for evaluation the services that the hotel gave. The form it’s needed for the marketing department, in order to improve the services.
- The payment can be made by card, or cash. The paying process is managed by an employee from the hotel.

The table of events is:

<table>
<thead>
<tr>
<th>Event number</th>
<th>Event description</th>
<th>System input</th>
<th>Input from Actor</th>
<th>System output</th>
<th>Output from Actor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Client Login</td>
<td>Username and password</td>
<td>Client</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sending the booking request</td>
<td>Room and client details</td>
<td>Client</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Processing the booking in system</td>
<td>Details about the room and client who made the booking</td>
<td>Confirm the booking room</td>
<td></td>
<td>Display the complete form from client book</td>
</tr>
<tr>
<td>4</td>
<td>Booking confirmation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use Case Diagram

The use case diagram designed for managing a hotel booking system defines three actors, representing the decision-makers from the hotel: the receptioner, a person representing the marketing department and the client. They assume multiple roles, highlighting the activities needed in this complex
Between the use cases we observe several types of relationships, such as:

- **Generalization** - the relationship between a use case and a developed version of it.

- **Extension** – when a use case (source) can be extended with the behavior of another use case (destination):

- **Inclusion** – when an instance of a use case (source) includes the behavior of another use case (destination):
Class Diagram

Analyzing the real objects from the organization and the links between them, we can design the class diagram. A class groups the elements with the certain structure, behavior and similar relationships.

In this case, we have classes corresponding to an external system (client), to the primary documents from the system (request form, paying documents), to transactions (bill) and descriptions of objects (currency, room). All of them give the static structure of the model, help in defining persistent objects, which will lead to implementation by oriented object languages.

Sequence diagram

One of the most important operations in the real system of rooms’ booking is the adding of a client. This means to register for him the request form, the bills, the service evaluation, and finally to have a client in the data base, to use him in the future promotions. To detail the sequence in time of this operation we design a sequence diagram:
Remark:
This state diagram induces another interventions in the class diagram in order to evidence the different situations from the payment process: we have to add in the RequestForm class the attribute `StateRequestForm` and the correspondent operation: `Complete RequestForm()`, `ValidRequestForm()` `UnvalidRequestForm()`.

**Activity Diagram**

We decided to design an activity diagram to detail the operation from a class's method. We choose the algorithm of calculating total value that a client have to pay, taking into account that there are many problems in the paying process.

![Activity Diagram]

Remark:
We can note the decisional blocks and the details necessaries in the implementation phase. Furthermore, this diagram requires to includ in DocPay class from diagram class, the attributes: `Val`, `ValTotF`, the method `ValueServFact()` and the method `TotalValue()`, needed for calculating the final value that the client have to pay.

**Class diagram** use in the implementation process

In the end of this example, we include the class diagram with the new operations, added after we designed the sequence, state and activity diagrams. This diagram helps the decision-maker to have a complete view regarding the
activities in the organization, it is the bases in the implementation process.

Conclusions

Unified Modelling Language used as visual tools for modeling elements, became an important Business Intelligence component in any organization. The decisional process can take advantages from the different but complementary views evidenced by the diagrams. The decision-makers can establish tasks for different persons who are involve in the decisional process, can chose the moment in which they interfere, the activities which would be influence by their decisions.

Firstly, we design the use case diagram, in order to view the functionality of the model. At this stage, there are no objects. Switching to an object structure is done by highlighting the objects which collaborate to obtain the functionality described by different use cases. So, we have the class diagram, a model with classes and relations between them. Sequence diagram, state diagram and activity diagram are subordinated to the class diagram and use elements and tools of oriented object methodology to complete the class diagram.

Theoretically, there are different models for the same situation. Unified Modelling Language supports object oriented representation of the entities defined in organization and allows the design of a model that can be analyzed by theoretical approach. The conclusions are extrapolated to the real system and lead to the improvement of the activities in organization. Decision-makers or specialists in financial analysis are the last mediators, who, depending on the context, accept or change parts of model or even the entire model. The success is based on their skills, his capabilities in foreseeing the
event and in anticipating the consequences.

**Bibliography**


