Business Process Modeling with Decision Model Integration

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Abstract: *Business Process Modeling is a technique that helps in improving organizational efficiency and quality but literature study reveals that none of the business process modeling techniques being used supports the decision making requirements for an organization. To address this problem the paper suggests a model that can help integrate decision making with the prevailing process models. The paper firstly reviews foundations of Business Process Modeling (BPM) to establish the basis for the conceptual understanding of BPM. With these theoretical bases, then a the model has been proposed where the Decision Model has been integrated with the Process Model to meet the decision making needs of the decision makers. Finally, the implications of this model are discussed with directions for further research.*

Keywords: *Business Process Modeling, Decision Model, BPMS, UML*

INTRODUCTION

Business process modeling (BPM) is not very new to business or IT professionals but it has gained momentum in the last few years and drawn the attention of business professionals, researchers and technology specialists. In fact due to changing faces of business, BPM has become a top business priority in modern business organizations. This in turn has triggered interest for researchers and IT professionals as a result better business process modeling solutions and standards are emerging. Even the famous Sarbanes-Oxley Act [4] emphasizes on business process management as efficient management of information and documentation.

Business Process Modeling

Business Process Modeling is a methodology that helps to view what a business process looks like and to understand and analyze business process for acquiring business efficiency.

The Object Management Group [14] defines a Model as "A model represents some concrete or abstract thing of interest, with a specific purpose in mind. The model is related to the thing by an explicit or implicit isomorphism"

Problem Statement

Business Process Modeling (BPM) is a contemporary trend which combines Business with Information Technology to achieve a competitive advantage. Processes are considered as 'Strategic Assets' [4] and BPM is considered as a technique to manage these Processes as Strategic Assets within an organization. BPM models the business processes which help in refinement of the process. There are many techniques/tools available that are used for Process Modeling but still organizations are struggling to achieve ways to model business that help in decision making. Modern Business Process Modeling techniques, to a certain degree, help in improving organizational efficiency but literature study reveals that none of the business process modeling techniques supports the decision making requirements for an organization. Modern organization need to fine tune the processes in such a way that flow of resources from input to output can not only be monitored but this flow of resources should be smooth in such a way that it can contribute in quick decision making as well. The author of this study would therefore study the current Business Process Modeling techniques and suggest how the decision making component can be incorporated to achieve efficiency and help decision makers in quick decision making.

THE DECISION MODEL

There has been a growth in Business Process Modeling techniques but it has been observed that among all such models one factor has been missing and that is the consideration of Business Decision Making. In order to overcome this deficiency the 'Decision Model' is discussed here. This is a technology independent generalized model to model business processes. It focuses on 'Business Logic'

When relational Model was introduced its focus of attention was 'Data'. Similarly the 'Decision Model' focuses on 'Business Logic' and 'Business Rules'. The Decision Model organizes business rules and business logic in a similarly rigorous manner to the way the Relational Model organizes data [27]. Table 1 gives the difference between Relational Model and Decision Model

Table 1 Comparing Relational Model with Decision Model [27]

RELATIONAL MODEL	DECISION MODEL
Changes the way we manage, leverage, store data	Changes the way we manage, leverage, store business logic

Recognizes that data has its own existence	Recognizes that business logic has its own existence
Elevates data as an organizational asset	Elevates business decisions (logic) as an organizational Asset
Introduces rigor through normalization principles	Introduces rigor through normalization principles
Impacts technology, methodology, and best practices	Impacts technology, methodology, and best practices

Components of Decision Model

The basic ingredient of the Business Model is the Business Logic. In this model the business logic is modeled but giving less attention to the style in which the logic is being modeled.

BUSINESS LOGIC (BL):

Business Logic is a term used to represent Business Rules. It is the means by which the business derives conclusions from facts

BUSINESS LOGIC STATEMENT (BLS):

It is termed as an expression of conditions. This expression helps evaluate facts and the conclusion drawn from this evaluation leads to a new fact. For example: suppose we have a condition 'A' which is based on certain facts (F). When condition A is evaluated based on facts F then the conclusion can be inferred. This facts (F) are evaluated then based on the results of condition A the results
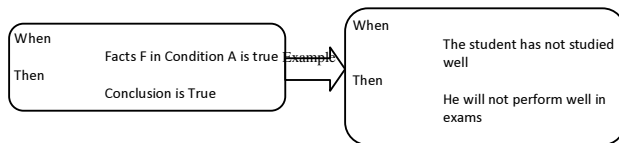

Figure 1 Example of a simple Business logic Statement

Here, one thing has to be noted that it is not always necessary to use the 'when' and 'then' statements. The Decision Model is free from any specific style or grammar. Any syntax that helps state the condition and conclusion can be used, like 'if' and 'then' statements.

STRUCTURE OF BUSINESS LOGIC STATEMENT

A Business Logic Statement comprises of two parts:
- Condition - based on Condition Assertion
- Conclusion - based on Conclusion Assertion

Each Assertion further comprises of three parts:
- Facts
- Fact type
- Operator

FACT & FACT TYPE

A *Fact* is basically just a piece of information, like if we say 'A student should study 5 hours daily to get a good grade', then the '5 hours' in this statement is a fact

A *Fact Type* is something that gives context to the fact, like in the statement 'A student should study 5 hours daily to get a good grade' the 5 hours is a fact where as 'the daily study hours for getting a good grade; is the Fact Type.

OPERATOR

An operator is something in a logical or Boolean form that tests the truth/logic and also connects the two assertions, e..g., 'less than' or 'greater than' or 'Is' or 'Is Not' etc

OPERAND

An Operand is just like a variable in an equation. In equations the variables hold a value on which the operation is applied. Similarly, here the Operand is a fact value.

A COMPLETE BUSINESS LOGIC STATEMENT

Based on this structure of Business Logic Statement it can be concluded that a Business Logic statement comprises of Condition and Concluding Assertions and each Assertion comprises of Fact Type, Operator and Operand. The structure of a Business Logic statement is given in figure 2
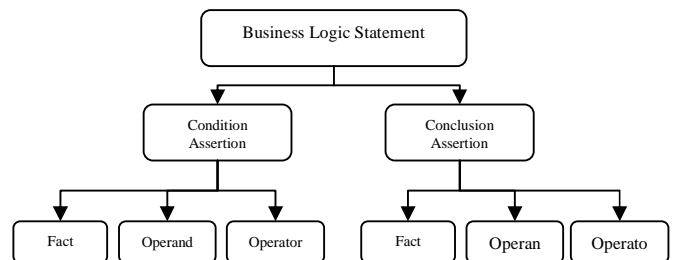

Figure 2 Structure OF Business Logic Statement

EXAMPLES OF A BUSINESS LOGIC STATEMENT

Suppose we take the example "*Performance of student A was excellent in the exams*" In this statement the structure would be:

Fact Type	→	*Performance of student A in the exams*
Operand	→	Excellent
Operator	→	Was

Table 2.shows some more examples of Business Logic Statements (BLS). Each row in the table is an assertion in BLS and it can take either the form of a condition assertion or a conclusion assertion

Table 2 Examples of Assertions in Business Logic Statements

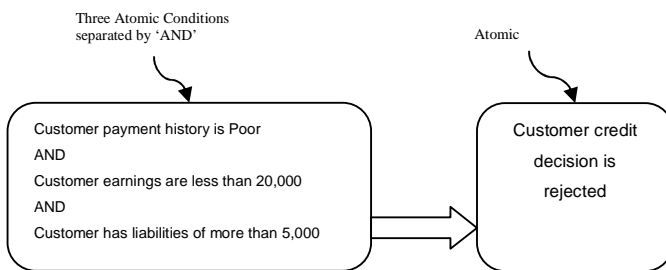| Fact type	Operator	Operand
Patient age	is greater than	54
Student score in xyz subject	Is	89
Customer status	Is	Active
Employee commission	Is calculated as	(sales – target) * commission rate
Sales target for April 2011	Is	10% higher than April 2010
Product ID	Is	A-234
Payment due date is	Before	3rd April

Figure 3 An Atomic Business Statement indicating a Business Logic

ATOMIC BUSINESS LOGIC STATEMENT (ABLS):

An Atomic Business Logic Statement is that BLS that is atomic in nature which means that it is the smallest possible BLS and it cannot be further broken down to yet another BLS. Following are the salient features of an Atomic Business Logic Statement:

- It allows simplicity of understanding hence eliminates ambiguity
- Due to simplicity and unambiguous nature of the ABLS, it becomes easier to analyze its accuracy.
- When accuracy is analyzed then precision can be easily achieved.
- Due to its precision, ABLS are by nature complete and consistent with business logic (rule)
- It is the most manageable form of the BLS
- A complete ABLS can have multiple Atomic Conditions separated by an 'AND' but all these conditions would lead to only one Atomic Conclusion

Figure 3 shows an example of a Complete Business Logic which consists of multiple Atomic Conditions separated by ANDs and leading to one Atomic Conclusion. In this

example it can be clearly seen that all conditions and conclusion are atomic in nature.

Now, in the real world the decision is not just based on one business logic. Each decision is based on multiple business logic (rules) so in the decision model it is suggested that in order to reach the final decision, all the business logic are combines to form a Rule Family

RULE FAMILIES (RF):
A Rule Family is basically the primary structure of the Decision Model where ABLS are grouped together to reach a conclusion or decision. Here grouping is done based on the fact Type of the Conclusion Assertion. As all the statements have already been brought down to the atomic state, therefore it becomes easier to form the Rule Families based on conclusion fact type.

A Rule Family can be represented in any form but it is suggested that for convenience the rule Families be represented in a two dimensional tabular form. Table 3 shows an example of a simple Rule Family. When naming a Rule Family it si again suggested that the name of the rule family should correspond to the conclusion fact type. In the example given in table… the name of rule family would be "Credit Decision" as this Rule table will help in deciding whether the customer should be allowed to buy products/services on credit or not. A Rule Family can help anyone whether it be business manager or an IT person, the rule family helps everyone to understand the business logic. Another advantage of a Rule family is that whenever a business logic changes, it will be easier to implement the change in the Rule Family table. Just by adding or removing rows or columns or by changing the values of the cells the business can get the new logic implemented

Table 3 Rule Family for Customer Credit Decision

CONDITIONS						CONCLUSION	
Customer payment history		Customer earnings		Customer liabilities		Customer credit decision	
is	Poor	are less than	20,000	are greater than	5,000	is	Rejected
is	Average	are less than	20,000	are greater than	5,000	is	Rejected
is	Excellent	are less than	20,000	are greater than	5,000	is	Accepted

BUILDING RULE FAMILIES

When populating a table for Rule Family the data in each cell comes from a source. This source can be a direct input like through a software screen or a web page screen etc. But it may not be a direct input as well. For example; in rule Family as given in table 4 the "Customer Payment History" can be either 'Poor', 'Average', or 'Excellent'. Now this is not a direct input but in it has to be decided based on some other input. In such cases there would be yet another Rule Family that would decide whether the 'Payment History' is Poor, Average or Excellent. Table…. shows another Rule Family that will help decide upon the 'customer Payment History'.

Table 4 Rule Family for Customer Payment History

CONDITIONS				CONCLUSION	
Customer amount paid		Customer payment received in a month		Customer payment history	
is	Full	Within first	10 days	Is	Excellent
is	Partial	Within first	10 days	Is	Good
is	Partial	During last	10 days	is	Average

The conclusion in Table 4 will become an input to the First Column (condition) of Rule Family; Customer Credit Decision given in table 3. In this way the Rule Families are built upon as shown in figure ….

BUSINESS DECISION (BD):

Once all the Rule Families are constructed then all the Rule Families are combined to form the final shape of the Decision Model for making decision.

In the Decision Model the Decisions are the main output, so the Decision Model is developed with a Top down approach. First it is decided what decision is to be made. Then Rule Families are made based on Atomic Business Logic Statements. Each Rule Family ends up in a Conclusion Assertion. Each Condition Assertion may or may not need an input from some other Rule Family hence accordingly further Rule Families are developed. The basic notations and shapes of the Decision Model are explained in Figure 4
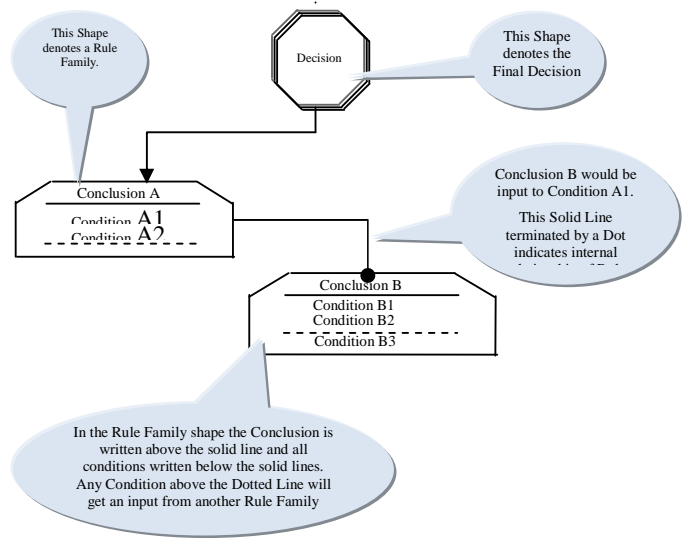

Figure 4 Building rule Families

THE DECISION MODEL EXAMPLE – CUSTOMER CREDIT DECISION

The Decision Model is an excellent modeling tool that would help decisions in making efficient decisions. A small example is that if suppose a customer wants to buy some products or services from a ABC Business. Suppose, ABC Business generally gives sells products & services to customers on credit and the customer pay the bills at a later period based on the predefined terms and conditions. But ABC Business does not sell products/services on credit to everyone. As this is a risky business, so ABC has to carefully evaluate every customer carefully before selling on credit. This is quite a difficult job for the management to decide for each customer. For this they needed to model the decision. Once the decision is made, then that decision can be integrated with the business process for sales and financial account management. Figure 5 shows the decision model for ABC to decide whether to make credit sales to a particular customer or not.
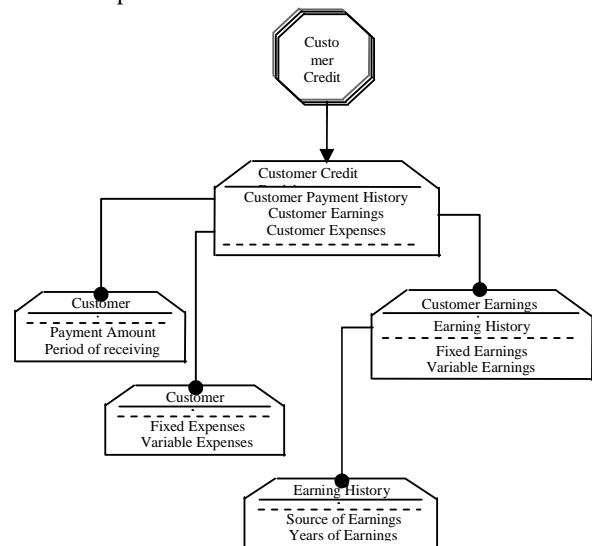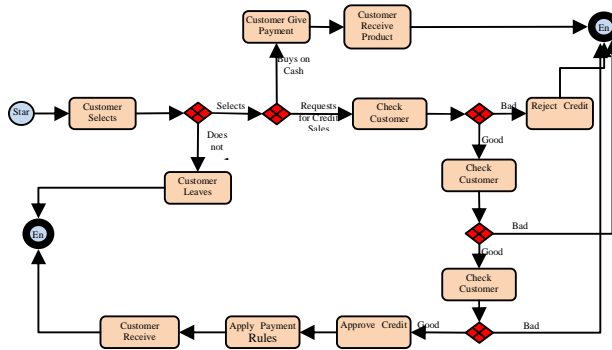
Figure 6: Process Model based on BPMN

The above discussed Decision Model purely focuses on the decision making activity of a business. But in business the need is to model the process in such a way that it helps in decision making as well. So the requirement is to have an Optimal Model that models process as well as the decisions both.

As there are numerous Process Models prevailing in the industry that are the outcome of long research and testing and as a result they have achieved a maturity level where they are able to quite efficiently model the business process. So, there is no need to start the work from scratch and come up with a new process modeling technique. In order to achieve a model that helps in managing the process as well as help in decision making the author of this study suggest to integrate the Decision Model with the Process Models.

There are many Process Models that have been used by the industry. These models have been quite successful in modeling business process. The Decision Model can be integrated with any of such model.

Developing an Optimal Model by integrating al the prevailing process models with the decision model would be out of the scope of this study. Therefore, for convenience integration is shown with one model.

For integration of Business Model with a Process Model, one of the recent and up to date Process Model that is BPMN is selected.

EXAMPLE

Suppose the previous customer example for which the decision model has been developed is taken into consideration. A customer buying goods and he can either buy on cash or request for credit buying. In case he is buying on credit then the management of the store has to decide whether to sell goods to that customer on credit or not. In such case the process model using BPMN notations is shown in figure 6

Figure 7 shows a modified version of the same process model when the model is integrated with the decision model. It is clearly seen that the new model is much simpler as compared to the previous one.
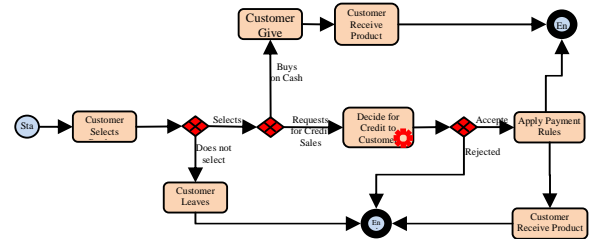

Figure 7: Process Model with integrated Decision Model

Now, the question is how did this magic happen? Well by just integrating the Decision Model it was possible to eliminate many a number of processes from the model. These processes were related to the credit Decision and all these processes were occurring in series.

If the processes are removed from the model then where did they go? All these decision making processes are now being handled by the decision model. This is denoted by a small Decision notation in figure 7.

With this example it has been proved that the Decision Model is a very efficient model in terms of Decision Making. Process Models are targeted towards modeling processes. So, if we combine both the models we can not only achieve simplicity in the model but we can achieve better results for managing the business in terms of Process Management as well as Decision Making.

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