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OBJECT –ORIENTED MODELING

ABSTRACT:

The integration and coordination of business processes in an enterprise is crucial for company's efforts to achieve its strategic goal. This paper reviews three articles and introduces a modeling scheme, which supports process centered approach in modeling the organizational structure. Since I was not familiar with this modeling concept I started with a paper fairly simple to understand. My first paper entitled "Object Oriented modeling for enterprise-level Concurrent Engineering" provides a fundamental framework for shifting from structured type traditional methods to an object technology. My second paper entitled "A DSS approach to developing systems to support production planning and control in smaller companies" uses a hybrid relational database/ object oriented modeling approach along with 'bill of production' for each item to model dynamic environment. The third paper entitled "Implementation of an object oriented tool for the simulation of manufacturing systems and its application to study the effect of flexibility" describes an object oriented simulator tool used for modeling flexible manufacturing systems.

This paper introduces a design paradigm in which a system is modeled, analyzed and implemented to define corporations overall need and facilitate effective decision-making.

INTRODUCTION:

The real world system or enterprise is a collection of different objects such a people, parts, machines, and products capable of behaving separately. The traditional modeling methods are not capable of modeling a system in this highly volatile environment. Object oriented modeling technique overcomes this shortcoming by providing features like reusability, encapsulation, information binding, and dynamic binding. The first paper explores the use of the object technology in modeling the production process to attain changing customer needs. The second paper reviewed demonstrates the use of hybrid relational database/object oriented system to generate the bill of production from the database only when it is required. The basic aim is to link customer orders and manufacturing operations throughout the enterprise. The third paper introduces an object-oriented simulator called OOSimFlex capable of modeling a FMS under varied levels of flexibility

Article 1: Object Oriented modeling for enterprise-level Concurrent Engineering.

The first article is entitled, "Object Oriented modeling for enterprise-level Concurrent Engineering " (Barnett, W.D. et al. 1997). This article provides an object-oriented technology for the analysis and design of a virtual enterprise.

This paper explains that the process of product design requires active coordination between interdependent and interrelated engineering disciplines. Concurrent Engineering as defined by the author in this paper "is the simultaneous, interactive, and interdisciplinary involvement of design, manufacturing, and field support engineers to reduce development cycle time". Concurrent engineering methods provides a foundation for the design of virtual enterprises. The author explains that the virtual enterprise is a temporary coordination of the partner enterprises. The success of the enterprise depends on how well the business processes of these partner organizations are integrated. Since this partnership is temporary it is likely that the partner organization returns to the competitive relationship. The author therefore points it out to the reader about the necessity to protect the business process and sensitive information and to provide a common basis for human interaction and communication to support the enterprise. He says that the traditional methods expose the decision-makers to unnecessary complexity and frequent recompilations. The article therefore proposes an idea to build a base model using objects in this dynamic competitive environment. The author describes the various classes with the help of a proposed object class hierarchy diagram. The business element class stands for the fundamental aspects consisting of people, place, and thing in the business environment. The organization class represents the constraint in the IDEF0 modeling syntax. The activity class represents the transformation of one unit of input work with one organization unit. The business process class is ordered set of activities. The model establishes a relationship between the business processes and organization class to represent the business control on the processes. The resource class represents the mechanism, but this class is further subdivided as enabler and end product. This is done because in a partnership organization the output of one activity can be input to another. The enabler here is the mechanism and input in the IDEF0 syntax (Barnett, W.D. et al. 1997).

This article presents concepts and object –oriented methods as an initial framework to make a transition from structured type methods to object orientation. It suggests ways to develop consistent process representation of the business processes in an enterprise. I would recommend all the aspiring consultants of tomorrow to read this article. This article uses lucid language and communicates the basic idea quite effectively.

Article 2: A DSS approach to developing systems to support production planning and control in smaller companies.

This paper entitled "A DSS approach to developing systems to support production planning and control in smaller companies" describes a low-cost DSS (Decision Support System) approach to maintain a link between customer orders and the shop floor throughout the production planning process.

It is observed that the SMEs (Smaller Manufacturing Enterprises) have to change their production schedules due to unsteady circumstances like changing preferences and technical difficulties. So the need to bridge this gap between the customer order and manufacturing operations is felt. This paper describes a hybrid relational database/ object-oriented approach to maintain a connection between the two departments. The initial approach found basic management areas and developed a template to support the decision-making. This approach was incorporated into a software system called ELMS (Emm Lane Manufacturing Software). The approach discussed in this paper is an extension of the ELMS approach. The core element in this process is the hybrid relational/object oriented database model consisting of related data elements and data structures. According to the author "it is a collection of concepts such as encapsulation inheritance, reuse and message passing" and these concepts facilitates wider coverage of the real world semantics. Every item, operation or customer object is identified from the relational database. The integration or the link between the different operations is through the Bill of production (BOP). BOP avoids violation of operational sequences during the planning stages. The fundamental idea behind this approach as proposed by the author is to build a 'template' BOPs from the data in the database when required. This is done due to the vast amount of information BOP will hold for every order for an individual product. An instance is

created in the BOP for every item identified. The template will hold all the information related to that order and a two-way communication would be established using standard query language.

This paper discusses an approach to planning and scheduling by utilizing object-oriented technology for volatile manufacturing data and relational database for the slow changing data. I would strongly recommend this paper to all industrial engineers and to the people working in fields like shop floor activity control and inventory management (Halsall & Price, 1999).

Article 3: Implementation of an object oriented tool for the simulation of manufacturing systems and its application to study the effect of flexibility.

The third article entitled "Implementation of an object oriented tool for the simulation of flexible manufacturing systems (FMS) and its application to study the effect of flexibility". This paper presents an object oriented modeling tool called OOSimFlex used for modeling for alternative system design and analysis of manufacturing system.

The author in this paper feels that not much importance is given to the word flexible in the modeling of FMS scenarios. The author claims that the modeling methods used currently define manufacturing operations as fixed routes. A FMS consists of different interacting virtual entities each designed to perform only one function. These entities can be physical entities, collective entities or control and operational entities with the job entity circulating throughout the system. These entities together form a generic virtual FMS model. The author considers that the manufacturing operations model does not consist of machines that only perform a single type of activity. The routing flexibility is represented using three methods of representations namely precedence graph operations, tree feasible operations and projected graph of operations show the possible states that can exist in a FMS. The model then abstracts operation and machine pairs from the complex system. The basic objective here is to find possible sequence of states (operations, machines) in the system. "The model is capable of redistributing the jobs to similar entities capable of doing the same operation required for the job or, in certain cases, to select a new alternative pair" (Borenstein, 2000). If no matches are found the job is directed to the central storage or the cellular buffer if it's a case of a breakdown. Classes of object represent these entities and relationships. The 'Task' class and the 'Simulation environment' are super classes

with possible events as their subclasses. For instance, a repair subclass is responsible for the fixing of the breakdown entity. Two different modules operate the OOSimFlex simulator, namely the ‘user-interface’ and the ‘kernel’ module. The user selects the layout in the factory using the icons. This built model is then executed in the kernel model. This model sends an action message to the all the resources in that event thus generating new events in the list (Borenstein, 2000).

This paper discusses OOSimFlex an object oriented simulator tool used to analyze and evaluate FMS scenarios and to represent manufacturing flexibility. I would strongly recommend reading this paper to those working in modeling of the manufacturing systems and in decision support. .

Incorporation:

The dynamic nature of today’s competitive environment cannot be over-emphasized. Traditional modeling methods are not adequate to provide consistent and valid models. By the time I start working in a company tings won’t be any different. I would use the object oriented modeling technology to improve inter and intra organizational communication, to improve assimilation of new technology, and to coordinate the business processes. I would use the hybrid relational database/object oriented system to link the customer orders with the shop floor in order to address the customer needs faster than my competitors. If was asked to model a FMS I would use the OOSimFlex or similar object oriented simulator tool to design and analyze the FMS under varying flexibility.

Summary:

I have learnt that model must define the organization’s goal. It should accommodate information, control, material, customer satisfaction and quality. It is critical for the company to come up with a valid model or else any error in the model will be transferred throughout the system. Object oriented modeling facilitates continuous reconfiguration of the system. This method improves final process design and promotes consistency. It serves as a potent tool with concepts like reusability, encapsulation, information binding and inheritance.

References:

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