

Object Oriented approach to integrating Business context with business processes.

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1 ABSTRACT

Successful change from a brick-and-mortar firm to a click-and-mortar organization depends on simultaneous analysis and change in all its major elements. The human element is a major element and yet neglected by organisational change methodologies. Especially the 'Context' comprising of deeply imbedded business models and mindsets are not captured by process methodologies of transformational change. The research question is 'How can *most* of the information related to the *context* of the business processes, mainly the human context, be systematically captured and integrated with the business processes?'

To answer the question, the researcher developed an Object Oriented approach to organisational understanding, based on Richard Watson's (1999) work on strategy for Internet organizations. The approach captures not only the processes, but also the attitudes, mindsets, behavioral patterns of people running those processes and their surrounding context. The interplay between them is captured through 'causal patterns' that are often at the root of organisational success or failure. Causal patterns are sustained patterns of behavior in an organisation, formed when behavioral patterns interact with each other. The OO approach adduced effectively captures, models and analyzes the phenomenon.

The OO approach was validated by applying it to an organisation. Case study research methodology was used. Research results indicate that 5 years back causal patterns led to good market reputation with loyalty of customers, suppliers and employees. Over time the business processes remained unchanged but the context changed, turning virtuous causal patterns into vicious. Reengineering would have failed, as the problem did not originate in business processes. The OO approach neatly captured the phenomenon.

The research implies 1] revision in change methodologies. 2] OO can be used to model Internet organizations, their strategies and internal operations simultaneously, increasing probability of successful transition to e-business 3] lead to realistic simulation of any organisation. 4] give directions to identify process granularity, help ERP implementation.

2 INTRODUCTION

With rapid transition to Internet, organizations are faced with transformational change (Hammer 2001). But traditional reengineering methodologies fail to capture business context (Oram, etal 1997) and it with business processes. This is of further importance as process reengineering continues to be used with ERP implementations (Hammer 2000). The research addresses this concern.

3 LITERATURE REVIEW

Business processes reengineering (BPR) questions the entire existing operation and tries to redesign it in a way that uses new technology to serve customers better (Jacobson 1995). Reengineering originated with process and IT-centered view of change (Hammer 1990, Davenport 1990). Simulation and analysis aided

selection of best 'process + IT' alternative. Some integrated reengineering with strategy planning, making it evolve from strategy and making it a routine activity. Others used creative methods to reengineer processes. The methodologies have a major lacuna of not considering human context.

The process approach “analyses and designs workflow and processes within and between organisations” (Davenport, Short 1990). Methodologies are given by Ould (1995) and many others. Process analysis methodologies and softwares like ARIS, STRIM/RAD, Action, SOM and IDEF among others were looked at. It was observed that “The role of people is seen [*only*] as performing steps in the procedures...Primary focus is minimizing cycle times and cost.” Scherr (1993).

Hammer (1990) proposed to “use information technology to radically redesign business processes to achieve dramatic performance improvements”. Process opportunities are summarized by Earl, Khan (1994). Methodologies are proposed by Davenport (1993) among others. IT implemented by many firms (Ascari et al 1995) demonstrate its impact.

Simulation and mathematical analysis lead to better decisions in changing business processes incase of multiple possible alternatives (Ackere et al 1993; Van der Aalst 2001). Its importance is seen in `Beer game' (Ackere et al 1993) and its implementation in Pacific Bell (Housel et al 1993).

Reengineering was linked to strategic objectives and used routinely to implement them (Earl et al 1995). This is done through benchmarking or continuous learning.

Business processes can be reengineered through creative techniques shaped around human behavior (Cooper, Markus, 1995). Among all approaches, only 'creative methods' may consider human context, but it is not offer a framework to capture or integrate human context with business processes.

In these approaches human context is advised to be considered, with no guidance offered for systematic analysis. Neglect of human context has lead to “limitations of machine-like organisational design, [where failure is] caused by the fact that people are after all, human, and not machine components” (Hendry 1995).

4 RESEARCH QUESTION

‘How can most of the information related to the *context* of the business processes, mainly the human context, be systematically captured and integrated with the business processes?’

OO approach was developed to answer it. The rest of the research verifies it.

5 OBJECT ORIENTED APPROACH

"The objective of OO design is to identify accurately the principle roles in organization or process, assign responsibilities to each role, and define circumstances under which roles interact with one another. Each role is encapsulated in form of object. This approach is different from more traditional analysis methods, whose emphasis is on process...a role oriented model is concerned with the policies or conditions that constrain task performance." (Pancake 1995, pg 34). This summarizes the new OO approach.

5.1 THE ORGANISATIONAL OBJECT

Watson (1999) proposed OO to understand inter-firm issues where each firm takes up a certain role to acquire and execution a customer's order. This is adapted to understand intra-firm issues, where groups of employees inside a firm take on different roles to execute the order [Figure 1]. The interpretation of 'know how' and 'know why' layers are different from that of Watson, and so are the object properties and characteristics [Table 1].

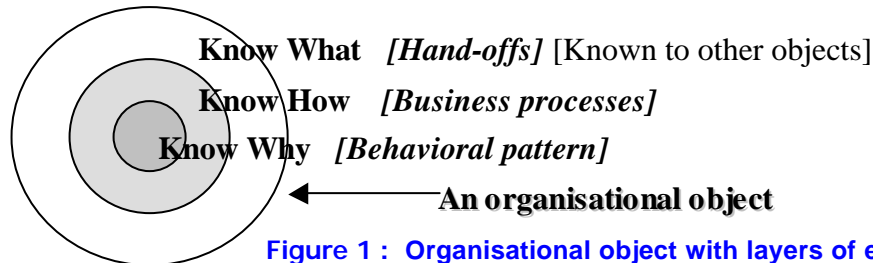


Figure 1 : Organisational object with layers of encapsulation.

Hand-offs / 'know what' layer:

Essentially the knowledge about what an object can do and how others trigger it to get services... its responsibilities, services, input requirements from others and its outputs. The information inputs are simple levers for other entities to get outputs/ services.

Business processes or 'know how' layer:

'Know how' is about the object's business processes, the data and methods, e.g. process of equipment designing; scheduling/prioritizing activities and requests. Inputs at 'know what' are processed by the object in its 'know how' layer, converting it into 'outputs'. The complex internal activities are hidden by the object from others, saving time and efforts for others to interact. Process change approaches deal at this layer and above, optimizing information linkages/ hand-offs and rationalizing process and individual process parts within objects.

Behavioral pattern or 'know why' layer:

Behavioral pattern explains why objects process requests the way they do. It explains the object's mindsets, values, beliefs and other conscious and subconscious properties evolving over a period of time. These are embedded deep into an object and form its core. It is the root of many an operational issue. E.g., 'Engineering design' object in a firm may get all order details from 'Sales', and yet fail to process request on time. If the problem is not in lack of resources, process bottlenecks, operator overload or some such process difficulties, the earlier two layers fail to explain the situation. The problem could be in Design perceiving Sales as an unimportant entity, thus treating its requests as unimportant [mindset]. Or it may perceive the order as technically uninteresting/ unimportant [drive]. Or it wants to get more respect and attention, as it feels neglected [drive to promote self-interest]. Many such situations exist in organisations that cannot be captured through processes mapping. The process of generation of 'know why' shows the extent and ability of the OO approach to capture high amount of organisational complexity.

Table 1 : Watson's application of OO juxtaposed with the OO Approach adduced [with support from Wand and Woo (1999)].

Concept	Computer science	Strategy [Inter-firm interactions]	Intra-firm interactions
Object class	A group of objects with similar properties.	A group of firms with similar properties [an industry].	A group of organisational unit / department with similar properties, but in different divisions/ firms.
Object	A program containing data and methods.	A firm with an organizational memory and business rules.	An organisational unit / department, with responsibility for certain services, memory, processes and rules.
Message	Objects request services from each other by exchanging messages.	Firms request services from each other by exchanging messages.	Departments request services from each other by exchanging messages.
Encapsulation	All processing that changes the state of an object is done within that object.	A firm is an autonomous unit, but there are situations where de-encapsulation is beneficial.	Business processes parts and subculture are encapsulated.
Reuse	A new application can be built from existing objects. Code must be written to exchange messages between objects.	A new firm can be built from existing firms. Procedures must be developed for exchanging messages between firms.	A new composite object [the firm] can be built from the blueprint of existing objects [roles/departments]. Procedures must be developed for exchanging messages between departments.
Generalization / specialization hierarchy	Object classes can be specializations or generalizations of other classes.	A multi-divisional corporation.	Example, the Human resources departments in each division of as multi-divisional organisation is specialisation of a central corporate Human resources.
Inheritance	Classes inherit properties from their superclass. Inherited properties can be reused or overridden. Inheritance eliminates redundant data and methods.	Divisions inherit properties from their corporation. Inherited properties can be reused or overridden. Inheritance eliminates redundant data and methods.	Departments inheriting properties from their central corporate definition. Inherited properties are reused or overridden. Inheritance eliminates redundant processes.
Attribute - Joint state variable - Internal state variable	A shared state variable changed by others, making the object unstable. The variable used by the object for internal manipulations/ operations to arrive at output.	Not specified.	Known to others who require service from object. e.g. 'order details' are required by design dept. If complete information is provided, the object is under obligation to provide service. The internal variables that the object [department] manipulates to provide requested service. Example, leave plan of its members, availability and distribution of scarce internal resources, etc.

Table 1 summarizes the application of OO concepts. Other OO concepts applied to organisational context but of lesser importance are:

1. Object class
2. Aggregation
3. Reuse
4. Inheritance—Generalization/ specialization
5. Polymorphism
6. Friend object

5.2 *EXISTENCE OF CAUSAL PATTERNS*

Likert (1961, pg. 108,109) mentions how Sales department forced other departments like production to decrease costs, thereby imposing excessive difficulties on them. Each tried to enlarge their area of responsibility, encroaching on other's territory leading to 'mutual recriminating circular process'. Recently causal patterns of high complexity were found by Rueylin (2001) explaining failure of IT in a firm. The dynamics were linked to chains of interlinking causes rooted deep inside the subculture of interacting departments. Interacting organisational objects capture such causal patterns.

5.3 *ORGANISATIONAL OBJECTS AND SUBCULTURES*

Handy (1985) suggests organisations are best served if different functions have different cultures to build deep functional strengths that can be defined and established through managerial action. "After all, who doesn't want accounting department to be cost-conscious, or researchers to be innovative?" [and not the reverse]...although this produces conflicts of interest (Caudron 1992). Most common subcultures are those based on function [or roles] (Caudron 1992). This is comprehensively captured by the object's layers. Organisational objects possess their own subcultures.

6 FIELD RESEARCH OBJECTIVES [RO]

To verify the OO approach, the researcher

1. Sought organisational units that could be viewed as objects,
2. Understood and modeled their characteristics into objects: know what, know how and know why layers.
3. Modeled their formal interactions as business processes
4. Modeled their informal interactions in terms of causal patterns
5. Integrated the causal patterns with business processes

7 RESEARCH METHOD

Case study research methodology was used. On the basis of certain derived criteria, specific case requirements were considered. Avasarala Automation Ltd. [AA] satisfied these conditions and was selected. From the research focus, 'Operational events to be studied' were formed, which translated into field questions that people in AA can relate to and answer.

7.1 *QUALITATIVE DATA ANALYSIS – CATEGORIZATION, INDEX DEVELOPMENT AND DATA CODING*

NUD*IST [Non-numeric, Unstructured, Data – Indexing, Searching and Theorizing] software was used. Data preparation included transcription and preparing it for NUD*IST.

Coding schema was created to provide support to OO approach. Two sets of nodes were created. First set supported the first three ROs, and represented organisational objects. Another set of nodes, representing causes and effects, modeled the object's informal interactions giving rise to causal patterns. Sample of nodes:

Level 1: Causal patterns

Level 2: Supplier payment delayed
Supplier delays material
Short supply to customer
:
:

The coding schema reflects the fundamental findings in this type of study. A statistic pulled from NUD*IST database to quantify the qualitative data is usually misleading. "If quantitative analysis was the aim it would have been better to have started with numbers in the first place and saved a lot of time" (Miles and Huberman, 1984). Effort was made to create an indexing schema resulting in greatest possible understanding of findings.

Quality was ensured through Construct validity, Internal validity, External validity and Reliability tests (Yin 1984).

8 RESEARCH ANALYSIS PROCESS

This section gives process of analyzing NUD*IST information to arrive at 'Research Results'.

8.1 RO 1: SEEK ORGANISATIONAL UNITS THAT CAN BE VIEWED AS OBJECTS.

The whole firm can be viewed as object (Watson, 1999), or a department, or, a group of people within a department/ organization, or, every single individual. After analysis, groups with similar drives, similar responsibilities leading to similar inputs, outputs and activities, were considered as objects. Basic concurrence was at 'know why' layer.

8.2 RO 2: DESCRIBE OBJECTS IN TERMS OF LAYERS OF ENCAPSULATION

The NUD*IST information was understood from OO perspective and summarized through an 'object definition template' created specifically to describe organisational objects.

8.3 RO 3: MODEL FORMAL OBJECT INTERACTIONS AS BUSINESS PROCESSES.

UML [Unified Modeling Language] constructs 'Swim lanes' to depict software object's interactions and workflow. This is modified to accommodate organisational object's layers and then used to depict business activities.

8.4 RO 4: INFORMAL OBJECT INTERACTIONS AS CAUSAL PATTERNS.

The organisational objects are described using the object definition template. It allows depiction of 'know why' layer, and also the causal links that connect objects to each other. These links bind together to form causal patterns.

8.5 RO 5: INTEGRATING BUSINESS PROCESSES WITH CAUSAL PATTERNS.

The concept of organisational objects conceptually unifies business processes with causal patterns by becoming the common point of origin. The Swim-lane concept is further extended to depict causal patterns as well as business processes.

9 RESEARCH RESULTS

AA manufactures material conveyor systems and Special Purpose Process Machines [SPPMs], employing 150 people. Material conveyor systems move refrigerators, cement, sugar, fish, etc in a plant. It is customized and customer involvement is high. Special Purpose Process Machines-- SPPMs are for special processing of material, like acid baths, made for specific customer requirements.

AA faced problems of profitability and customer retention. It also faced problems of chronic delays in delivery, account receivables, supplier non-cooperation and many others. These problems affected the bottom-line.

Each employee was initially considered as an object. Those with similar drives/motivations were grouped into one object. Each object was described through object definition templates.

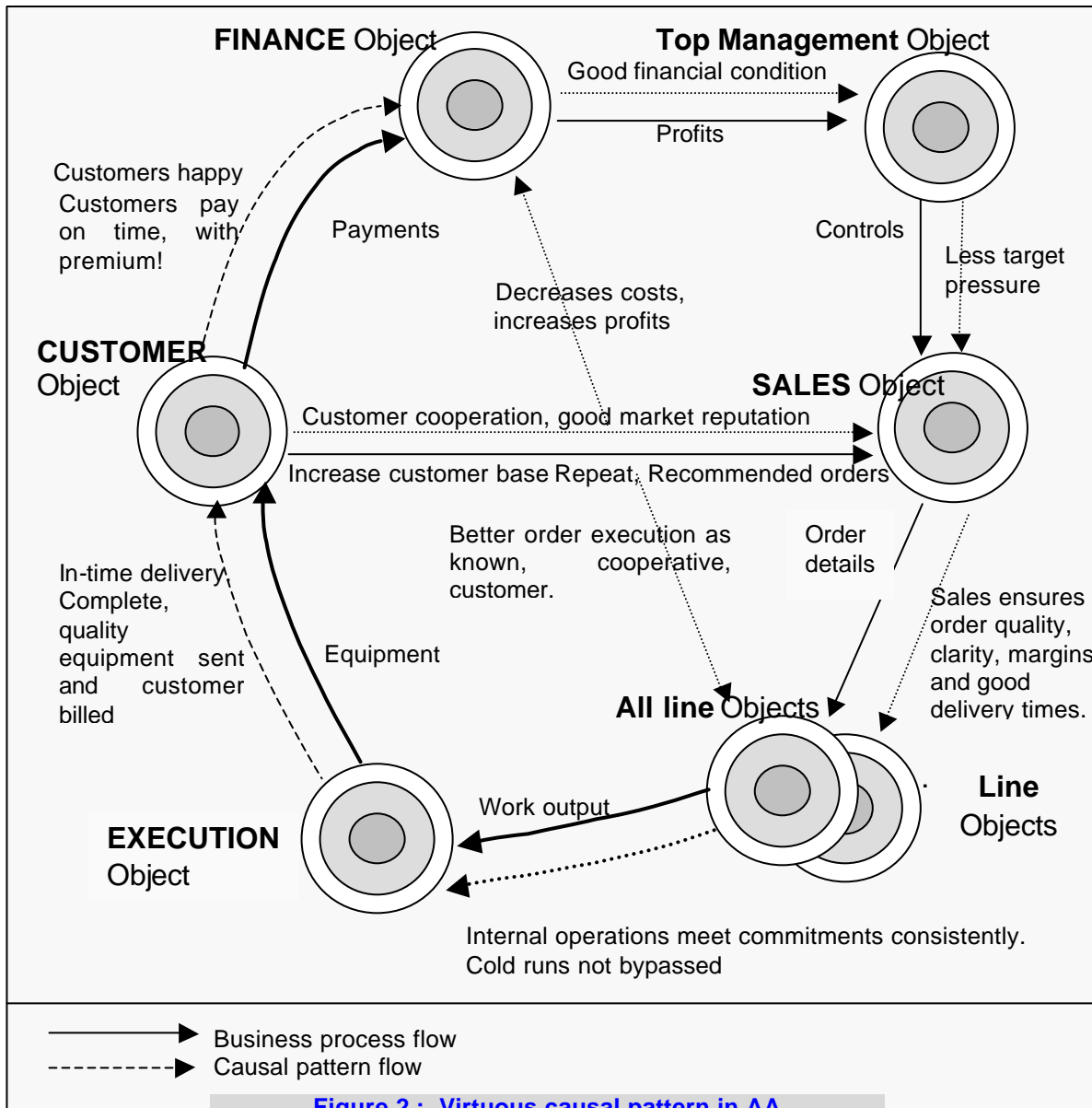
Organisational objects [objects considered as part of system]	External objects [objects not a part of the system]
1. Sales	13. Customer
2. Application	14. Supplier
3. Design	
:	

These were named according to their responsibilities. Some of them were pre-defined departments, like `Design`. Mostly others like `application`, which formed a part of Sales department, were not identified by AA as departments and could be discerned only through the OO lens.

The swim lanes depiction of business processes efficiently depicted the interaction of organisational objects at their `know what` and `know how` layers`.

The central part of the research results was the causal patterns, capturing the context. Five years back AA had minimum three sustained causal patterns bringing good market reputation, customer and supplier loyalty, and employee loyalty. Over the years each virtuous causal patterns turned into vicious ones, merely with change in external market context. One such causal pattern is depicted below.

Prior to 1996, market was booming. Sales had more customers and orders that they required. This allowed focus on order quality and negotiating better deals. Order clarity and proper delivery schedules allowed AA to meet promises. As most were repeat customers, their requirements were known and communication channels established, allowing smooth collaborations. This increased profitability, while repeat customers offered premium for staying with AA!



CONTEXT CHANGE:

In mid 1990s, liberalization policies in India lead to growth of market demand. AA's market reputation made it easy to get new orders. AA decided to increase scale of operations, recruiting new employees rapidly. The organisation became too big and unwieldy for the management used to small, known, close-knit group of people. The virtuous pattern broke in 1996 end when industry recession set in, dramatically shrinking market size, leaving too many sellers and too few buyers. Buyers were strapped for funds. Margins decreased and so did order size and volume. More efforts and overheads were required to get and execute orders.

The company's slogan was 'one-stop-shop', where customers can shop for all their needs. Sales viewed it as "One stop shop-- customer does not come back again. It has literally become that. It is supposed to mean something else but now it means this to me."

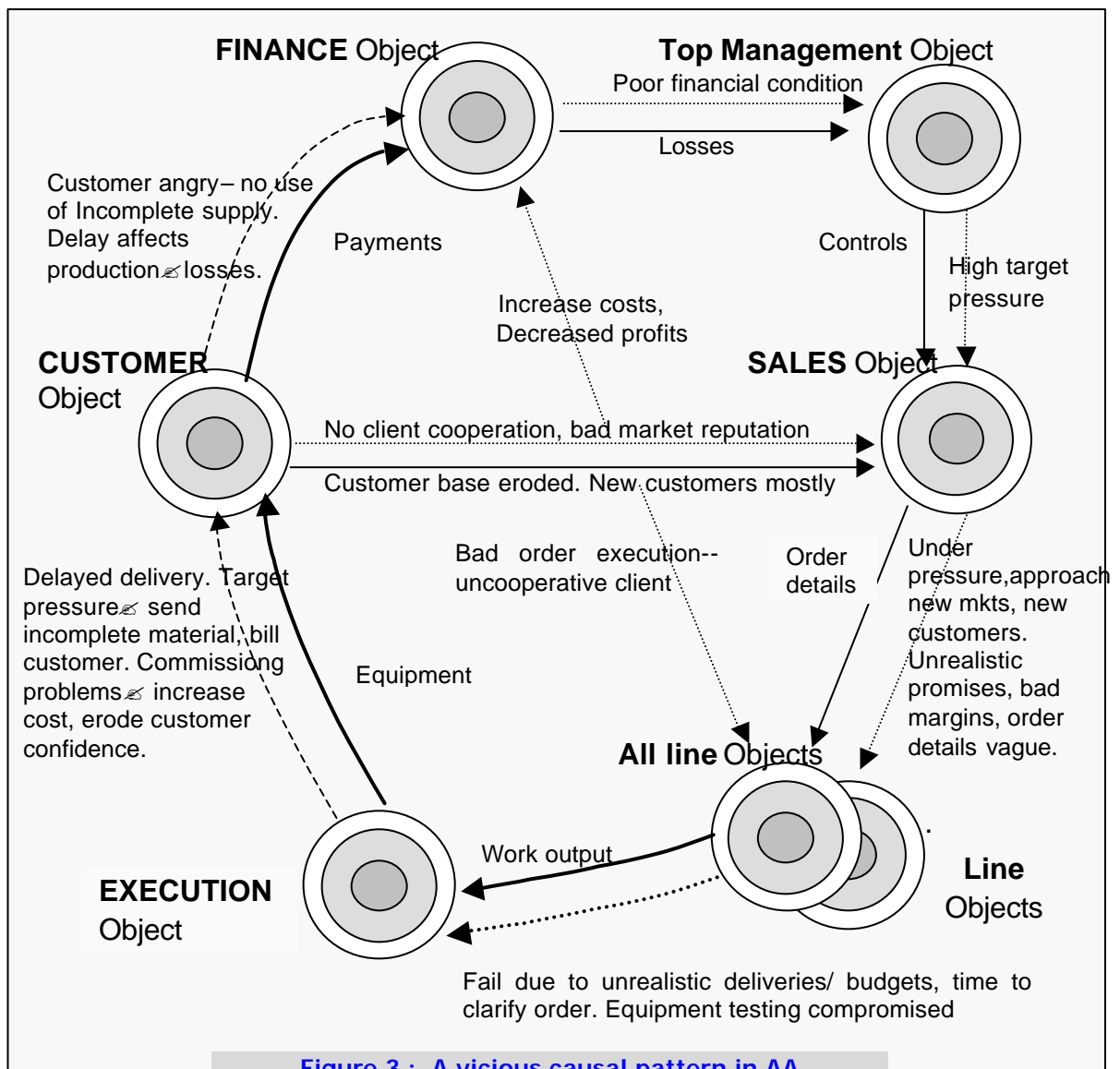


Figure 3 : A vicious causal pattern in AA

As AA had not changed its processes over the years, this critical aspect was completely missed out in purely process view of organisation. Whereas the OO approach perfectly captured the phenomenon. After all the OO approach originated in the desire to capture such phenomena observed in Thermax Ltd. Observations in AA firmly established existence of causal patterns that capture the crucial part of organisational context, and established it was separate and distinct from business processes. It also established its critical role in describing any organisation, and showed it could be captured only through OO approach. It was observed that business processes and causal patterns influenced each other deeply and had to be considered together. This is inline with observation of various researchers (Wentz 2000). The object representation of organisational working conceptually integrated business processes with causal patterns, and the swimlane concept integrated them in depiction. This addressed the last research objective.

10 RESEARCH CONTRIBUTIONS AND LIMITATIONS

10.1 CONTRIBUTIONS

Practitioners benefit from:

- ?? Better understanding of organisation
- ?? Better planning of efforts
- ?? Better anticipation/ prediction of problems
- ?? Better implementation
- ?? Better sustainability of changes

The most important contribution is to demonstrate how two very different fields of business management, organisation behavior and information systems, can further gain from each other.

10.2 IMPLICATIONS:

1. Model Internet based organisations: According to Hammer (2001), “The revolutionary impact of the Internet will be in dissolving boundaries between companies.” This is the virtual integration between organisations on non- core competence areas, like transportation of their goods, financial accounting, etc. Just as businesses reengineered internal processes helped reduce inventory, overhead and cycle times, they will now reengineer externally by combining certain processes across enterprises to gain even bigger benefits. This is seen in the common procurement Internet marketplaces like ‘Covisint’ owned by General Motors, Ford, DaimlerChrysler AG, Nissan, Renault and Peugeot-Citroen, who have traditionally been bitter competitors of each other.

The creation of multiple avenues for conducting business, the possibilities of dynamic collaborations and the forces of mass-customisation lead to employees having to routinely take certain decisions, which earlier was a prerogative of top management. The choices would be influenced by the causal patterns. Understanding and influencing the causal patterns instead, makes employees follow a decision pattern favorable to organisation’s profitability and values. Especially with the internet, the external forces of influence has increased, necessitating strong internal causal patterns to counter any negative forces.

Deep internal changes are also necessitated by strategic alliances. Examples like Covisint now abound, as they reengineer processes externally and internally. Such an organisational change can be easily modeled by simultaneously using the adduced OO approach that look internally, with the approach by Dr. Watson (2000). With OO, it should be possible to dramatically bring down the failure rate of organisational change, as the approach models most of the root causes of the critical organisational problem areas.

2. Organisational complexity to a large extent can be captured, understood and analyzed methodically: This reduces dependence on those having deep experience and judgement of human behavior. It implies possibility of

creating 'know why' layers to use human potential effectively while increasing business success.

3. Revision in change methodologies: Methodologies can now modify themselves to include 'business context'.
4. Comprehensively simulation of organisations: Causal patterns may be constructed/ predicted [new firm]/ detected [existing firm], to influence 'virtuous' and detract 'vicious' ones.
5. Improved change efforts due to coupled IT and business systems: Organisational objects in one model can correspond to software objects in the other, giving a clear picture of the goals that business systems and information systems would meet together.
6. Modeling human societies with OO: Wherever there is division of labor or difference in work and these groups have to interact, they can be represented using OO.
7. Process granularity for process change: As reengineering is often conducted before implementing ERP, it assumes serious proportions. Process identification is easy with OO— process boundary is either an organisational object [for process changes], or, originating link/ weakest link in causal pattern one attempts to break.

10.3 LIMITATIONS:

1. The OO approach fails to reflect full organisational reality:
 - I. Context elements like opportunity, goal setting and constraints (Mowday, Sutton 1993) are captured by OO approach. Whereas 'powerful leaders' is not.
 - II. Representation of Supplier or Customer roles, when each customer/supplier has vastly different profiles, is not effectively addressed.
2. It represents just a part of what is possible in the vast field of OO.

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