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BUSINESS PROCESS MODELING IN PRODUCTION AND DISTRIBUTION PROCESSES BY ENSURING INFORMATION INTEGRITY

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ABSTRACT

The paper aims to discuss the Information Integrity issues in the wake of increasing business integration on account of increasing ICT usage. It goes further to suggest an analytical solution and illustrate the same by applying it to Production and Distribution Management In order to do the above the paper defines information integrity and suggests a model of Information Base Management System with an acquisition and utilization cycle attached. The model rests on an Information Topology Plane. The model also suggests a mechanism to originate the information in the acquisition and utilization cycle with a view to preserve information integrity. Business integration is on the rise on account of increased usage of information technology systems. In wake of this situation the key issue is no more information manipulation, it is to ensure the accuracy, consistency and reliability i.e. information integrity. The paper adds authentic value as it suggests the need for information integrity in the wake of uncertainties arising in industrial management systems on account of increased automation and information technology usage. In order to do this it suggests a unique Information Base Management System and information origination mechanism for the same. An illustration of implementation of the model is shown using a lucid example of Production and Distribution Management

Keyword: *Information Systems, Uncertainties, Business Environment, Acquisition Cycle, Utilization Cycle, Enterprise Development*

1. INFORMATION INTEGRATION IN CURRENT SCENARIO

In the industrial society, the strategic advantage came from use of power source, initially the steam engine and later the internal combustion engine or the electric motor. In these conditions, organizations sought "standard" product in high-volume-mechanical-manufacture based business models. These (models) emphasized material and energy processing, comprised physical work systems, and had their (models') systems, sub-systems and their components rigidly (as against *loosely*) connected. Complexity of the business system and that of market was that of order, viewed more as a linearly predictable (and, therefore, a static) entity. For example, the product design emphasized "standard", i.e, collective design information decision, which was insensitive to customer requirements of local market factor based ever-changing "individual" situations - sales model validated in a given market environment was considered transferable, i.e., linearly extendable, in *another* market environment without due consideration being given to (benefits or consequences that can be achieved or accrue) from variations in business system environmental factors such as objects (hardware as well as concepts), people, norms (standards), rules and procedures, instruction (software), financial mechanisms, policies, etc. In the form of applications such as accounting system, production system, inventory system, quality system, etc., the models had computerized information systems but they (information systems) processed structured (i.e., expectedly predictable) information and were generally justified (for competitive advantage) purely on the economic (cost reduction) grounds of reducing clerical work. Even when the organizations became aware of the information systems' potential for solving management problems of planning, direction and control, they

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(organizations) continued using information systems emphasizing collective decision-making processes, and there was no effort made to optimize data or information for improved decision-making for competitive advantage by way of increased market share.

However, with the technological reality of the data-driven technologies keyed to the flow of digital data throughout an enterprise system and on the Net and with pressures of achieving business objectives of effectiveness and economy through requirements of mass-customization, agility-focused on customer responsiveness, IT driven market differentiation, supply-chain synchronization by integration maximization and financial optimization for strategic advantage, a business enterprise now has a need for utilizing data/ information decision 'smarter' by way of "individual" design information decision [Mandke,Nayar,2000].

Specifically, what this 'smarter' design information decision requires is the production (origination or acquisition) of relevant normative (evaluative) maximal information in respect of local market factor based system environmental situations, without which the factual (source or process based) minimal information items traditionally retrieved from databases are distorted and incomplete and not useful for making improved design information decision.

As economy makes a transition from industrial society to the one based on knowledge and services, the key determinant is, thus, shifting from product quality improvement (as under the "standard" product in high volume business model) to individual design information decision improvement. In the turbulent business environment of today those business organizations will survive, which are able to make continuous design information decision improvement. The information they have will have to be the result of improved interplay between useful information systems and databases

Within the context outlined above, there is *yet* another issue - in addition to the uncertainty and judgmental factors at IS-human interface [Moray, 1994],[Mandke, Nayar, 1995] concerning the IS design methodologies that start *from* user needs (requirements identification) *to* giving her finished information systems and information there from for *use* by way of delivery of improved decision-making. Specifically, it makes databases deal with evaluative information items that are not *only* function of "source" (information in this form is normally termed 'data') and at the most of "process" (which includes medium of communication) but also of "recipient", i.e., *user* with the objective of improved decision-making. This again introduces new types of data inconsistencies and errors in the database. Because now the database does not only have the data being entered and stored, it has also to account for information origination and evaluation and for the errors arising out of the data origination and evaluation, processing it through channels (medium) for entering it into the database, and (for the errors arising) out of incorrect use of information [Mandke, Nayar, 1997].

In fact, with increasing use of computing and communication technology in IS and with incessant use of computerized information systems for global operations, system environmental factors of Complexity, Change, Communication, Conversion and Corruption (5 Cs) have started impacting the IS and databases, thereby introducing further data inconsistencies and information errors [Rajaraman, 1995] [Rabelo, 2007]. These system environmental factors are outside the logical environment of the traditional database design view and, hence, errors (as a result of them) are not amenable to control by data integrity mechanisms controls normally considered at the DBMS design stage. Information systems and hence the databases lying there in are open systems.

Information Base Management System proposes to attach an acquisition and utilization cycle to the traditional information system/database view [Mandke, Nayar, 2002]. This acquisition cycle should acquire information in order to maintain the integrity of the information base. The utilization cycle should ensure the utilization of information flowing in the system; it should also ensure that integrity is maintained from the end users' perspective. This brings in the question as to how this process be managed so that it will aid in decision making with integrity by using the information base of the acquisition cycle or by using the acquisition cycle to acquire more information

2. THE ACQUISITION AND UTILIZATION CYCLE

The following schematic depicts the systems view of above concepts.

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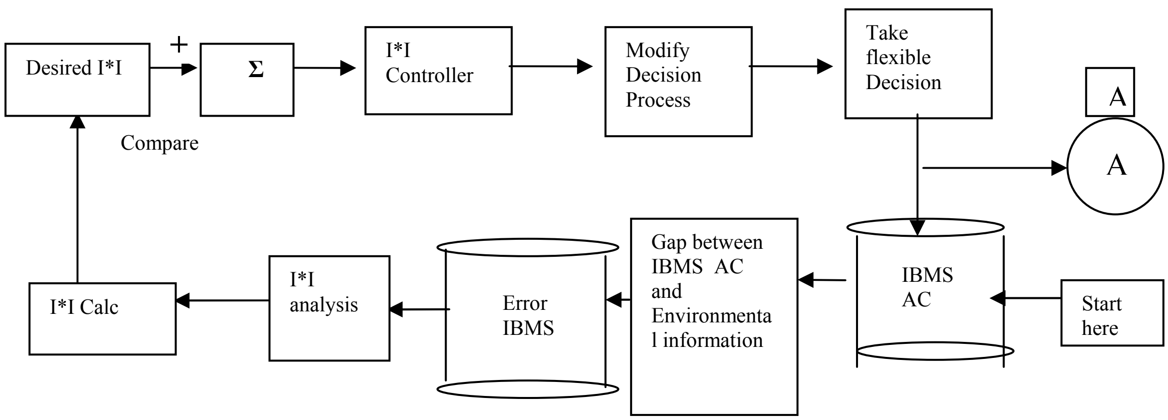

Fig 3.1: The acquisition cycle

Fig 3.1 depicts that given the summation of Information Integrity specifications, there are a collection of errors in the database. I*I controller checks these errors and modifies the decision process. The information base is both updated and current information in the information base supports the decision process. However the information base is not in tandem with the environment, there are gaps. These gaps find space as errors in the error database, which forms the basis of I*I analysis. This diagram is specific to acquisition cycle because with respect to environment, I*I controller is modifying the decision process and subsequently updating the IBMS AC (acquisition cycle information base) and error IBMS with the gaps. As stated above the error information base management system forms the basis of analysis for calculating integrity status.

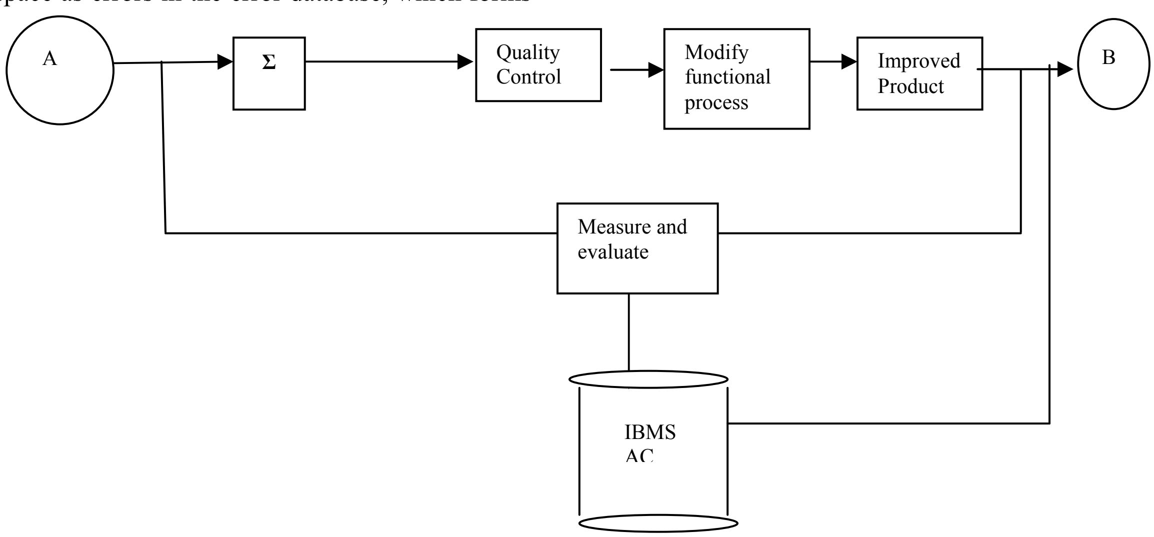

Fig 3.2: Schematic depicting a system

Fig 3.2 depicts the informational view of any business system. As discussed earlier any information system goes hand in glove with a database. The schematic shows how the quality assurance processes in the IS are supported by the acquisition cycle information base. An important aspect depicted by this schematic is that quality of processes and product may be encompassed by an integrity information system database.

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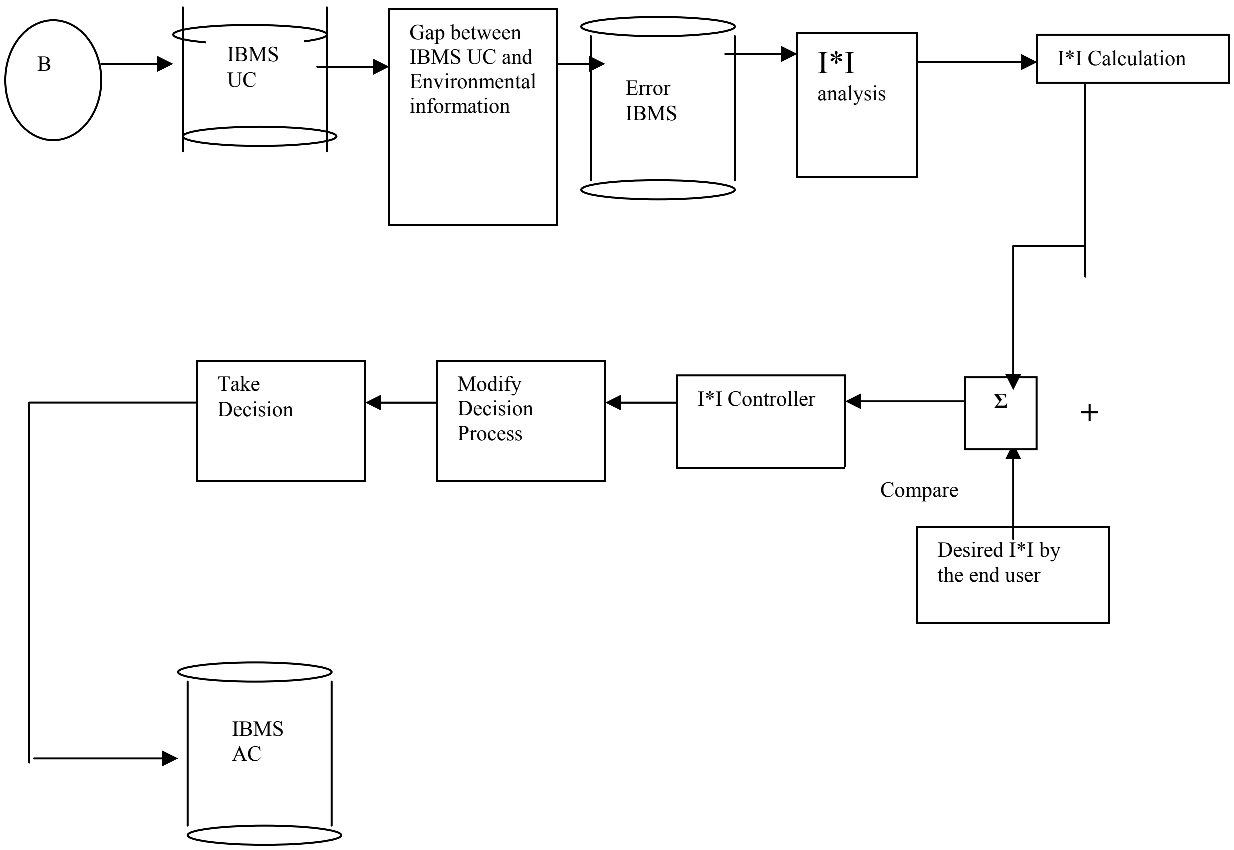

Fig 3.3: The utilization cycle

Fig 3.3 depicts the utilization cycle. This shows how the information flowing in the system is being utilized. Also it helps in checking the Information Integrity from the end users' viewpoint. It uses the acquisition cycle and also contributes to the development of the information base of the acquisition cycle.

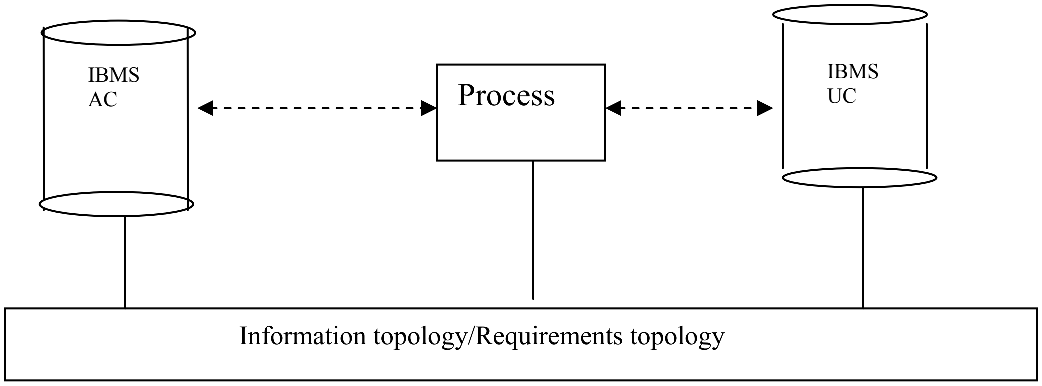

Fig 3.4: Schematic depicting the IBMS

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Fig 3.4 depicts in a nutshell depicts how the IBMS will preserve the integrity of information by continuously acquiring and utilizing information. The entire IBMS will rest on the information topology plane. This is a flexible plane which can stretch with the requirements of the information system. The IBMS is said to be resting on the horizontal plane because the requirements are envisaged as an orthogonal structure. Slicing it for understanding of various data elements will make this planar structure. On this plane are embedded various data elements, which depict the contours of information in the real world. On this contours we will base the acquisition and utilization of information for data elements.

3. THE INFORMATION TOPOLOGY (IT)

Environment comprises of information systems and information variable. It has people, software, communication, norms, rules, procedures, financial mechanisms and object like hardware, concepts. Living organisms, organizations, systems and businesses that IS they are, experience uncertainties in respect to their environment. These uncertainties bring about threats, risk and opportunities. It is by originating information that systems can reduce threats and risks and on the other side increase opportunities. Information constitutes as the only workable mechanism by which systems, their subsystems and their components cognize respective environments. This environment is synonymous with information and its requirements.

The real world problems are open ended problems, and by no means, a complete problem can be comprehended and solved. IS developed and deployed in a specific environment is always confronted with such open ended problems, as a result of the uncertainties in the environment. A blind eye to such problems results in significant drop in the effectiveness, economy and efficiency of IS. The designer of an IS thus has to draw a boundary to focus on that particular problem (problem information), making some environmental factors internal while others as external to the system. The traditional design of IS is done in isolation, assuming the environment to be static, not considering the dynamism of reality. But for competitive advantage the IS with integrity should be designed which should consider the evolving, conflicting and ever-changing environment. This calls upon for the designer to anticipate various environments where the IS would be deployed in and also of the neighboring IS which have direct and indirect impact on that IS.

Information Topology is an abstraction from the environment discussed above. It is developed through an iterative and continuous process of information origination, evaluation and processing.

4. ATTRIBUTES OF INFORMATION TOPOLOGY (IT)

It is enriched with information envelope. Each layer has informational processes and decision mile-posts. This reduces the problem complexity while ensuring effectiveness and economic solutions. That is to say that how much of information should be originated in the topology. To this the answer is that corresponds to the information requirement of the dynamic decision stages.

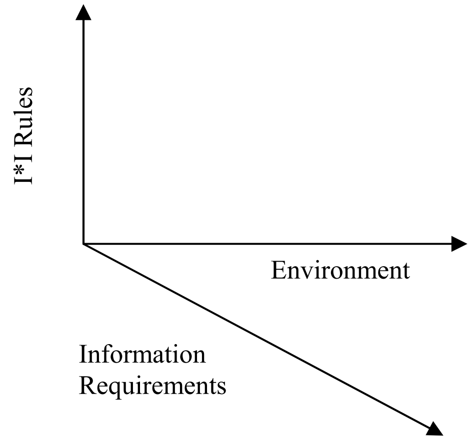

Fig.3.5 Attributes considered for ET/IT

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The above diagram throws light on three attributes to build the IT. They are environment, informational requirements and (I*I Rules) decision stages. The informational requirements identified during the projects are as follows-
Normal, standard requirement: Requirements are either given by the customer or assumed by the supplier, mostly latter. (Customer can be external as well as internal, internal customer coming into the picture when business process undergo changes due shift in data driven technology application across the enterprise-wide supply chain.) Given this it is common for supplier to assume normal, standard requirements for a customer with assumed eligibility criteria. However, there are issues, what-if eligibility not satisfied? Should that mean no consideration of that customer? For example, for product sale, supplier may assume that customer is eligible who has money with him at that time. What-if the customer is not having money? What additional requirements supplier must anticipate, *ex-ante,* so as to not to loose that customer and not suffer business loss. In other words, it should be useful to define along with normal, standard customer eligibility requirements, requirement with marginal eligibility deficiency. There can be other requirements as well such as:

- Requirements with deficiencies.
- Shifting requirements i.e. shifting in conceptual objects which can be
  - Informational objects, mainly to be found in service sector. Also, budgets at zero based etc.
  - Functional Objects – desired and maintainable.
  - Performance based objects.
- Requirements acceleration.
- Requirements delaying.
- Requirements coming with delays
- Transfer of requirements, horizontal, mobility of requirements
- Combination of requirements.
- Requirements with vertical mobility, telescoping(moving from lower level requirements to higher level requirements missing out on some in between subsequent levels)
- Decline in requirements.
- Evolving requirements – changing priorities.
- Conflicting requirements, complex requirements.

This view of requirement is pregnant with design bases for error tolerant Information bases with Integrity. These requirements transform into the goal set at various decision stages. These goals sets then need to be stored in the information base. Subsequently to meet each requirement (transformed as a goal set) data should be accumulated (originated and acquired). How far the requirement is met and how much more data is required in the design bases is then calculated, acquired and utilized. Process of transformation goes through various decision stages. The decisions stages can be identified as D0-D22 [Mandke, Nayar, Malik, 2001]. They are being enumerated as D0-D22 so that classification in to groups can be made:-

- D0 – Obtaining current basis data/information on requirements of: (a) Recipient (customer) under consideration (covers objects [concrete, abstract], humans, rules, norms, commands, etc.), (b) Business process costs and capabilities, (c) Questions, etc.
- D1 - Based on long-term goal set, determining Positive/Negative Goals, General/Specific Goals, Clear Goals, and Implicit Goals.
- D2- Transforming Negative Goals into Positive Goals.
- D3 - For Positive Goals identified, setting Intermediate Goals.
- D4- For the problem solving situation, identifying environmental anomalies or malfunctions that will emerge with delay.
- D5 - Given the malfunctions that will come with delay, determining what must remain unchanged, i.e., identifying environmental anomalies that must not occur in the process of problem solving.
- D6 - Based on (D5), delineating multiple goals to make implicit problem solving goals explicit.
- D7 - Based on Specific Goals (D1), (D3), (D5) and (D6), determining many factors and multiple criteria.
- D8 - Based on [(D3), (D5), (D6), and] (D7), determining independent goals.
- D9 - Based on (D8), deciding delegation (contracting), identifying uncertainties in delegated decision-making, and deciding operable goal statements.
- D10 - Based on [(D3), (D5), (D6), and] (D7), determining information about

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interdependent goals, which are positively linked.

- D11 - Based on (D10), selecting central goal from amongst positively linked goals and deciding operable goal statement.
- D12 - Based on (D10), deciding ranking of positively linked goals without time pressure and selecting operable goal statement.
- D13 - Based on (D10), deciding ranking of positively linked goals with time pressure and selecting operable goal statement.
- D14 - Based on (D3), (D5), (D6), and (D7), determining information about interdependent goals, which are negatively linked (i.e., conflicting goals).
- D15 - Based on (D14), *choosing*, from conflicting goals with uncertainty, the operable goal statement.
- D16 - From formally operable goal statement, defining planning & design constraints and opportunity spaces.
- D17 - From 'many factor' information variables characterizing problem complexity, culling out useful (relevant) information variables.
- D18 - Recognizing relationships (interdependencies) between culled out information variables
- D19 - Developing state transition model defining dynamic behavior of culled out state (information) variables.
- D20 - Within the framework of opportunity and constraints' spaces (D16) and based on the state transition model (D19), undertaking customized planning & design (i.e., unstructured and a periodic processing of factual information continuously obtained on current basis for the problem at hand (Section (4-f))) for generating alternatives for evaluation.
- D21 - Evaluating alternatives generated at (D20) for their contributions to operable goals.
- D22 - Selecting flexible information decision for control implementation.

The environment would comprise of objects like

- People (like stakeholders, external user and internal user).
- Hardware.
- Software.
  - Requirements, analysis, design, development, technology (networks, web etc), testing, implementation, maintenance procedures.
- Norms.
- Policies.
- Rules.
- Procedures
- Concepts.
- Financial Mechanisms.

I*I rules in the fig 3.5 encapsulate the decision stages. Every data element in the database is basically these informational variables, characterized with performance standard, performance criteria and situational value. The origination processes are identified as per the information envelope.

5. ARCHITECTURE OF IT

As the result of considering the above stated mile-posts, we obtain a multi-layered IT. The layers can be infinite in number but here we consider three for the understanding of the concept.

Layer 1: Problem Information.

Layer 2: Problem Environment Information.

Layer 3: Alternative Information.

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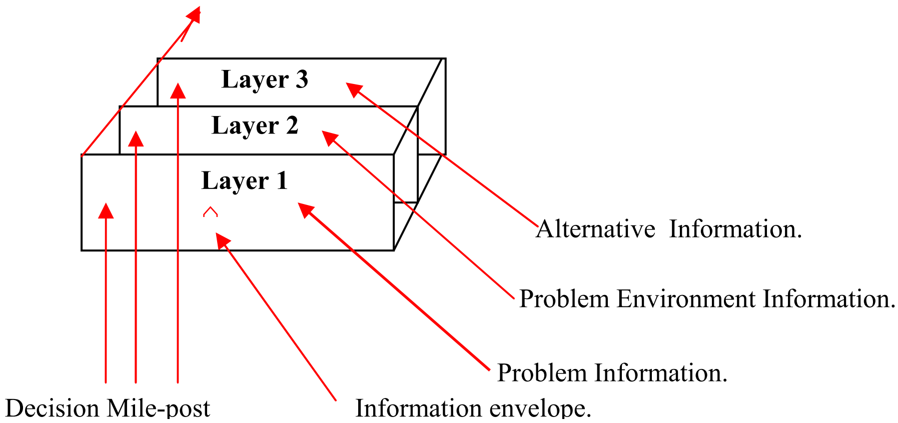

Fig 3.6: Architecture of IT.

Layer 1: Problem Information defines the problem. It clarifies or articulates the needs that must be met. The planning process of problem information has following four processes and their respective decision mile-post, namely,

- Analysis of needs.
  - D0.
- Determination of objectives.
  - D1-D7.
- Operational definition of objectives.
  - D8-D15.

Layer 2: Problem Environment Information reveals the opportunities and constraints that open or restrict the range of possible solutions and the general environment conditions, which will affect the contributions any potential solution will make to the various objectives. This layer consists of information about environment in which the problem is stated and would be deployed. The planning process of problem environment information has following two processes and their respective decision mile-post, namely,

- Basic studies: resources potential and needs.
  - D16-D17
- Analytical model.
  - D18.

Layer 3: Alternative Information is used for evaluating, selection of flexible information decision. The planning process for production of alternative information and decision mile-posts are:

- Systems synthesis.
  - D19-D22.

The layers are enriched with Information Envelope as shown in the fig 6 above. It is useful tool for information origination, evaluation and processing. Therefore, in developing problem information (Layer 1), first it is important to recognize that information is an envelope of values, objectives, goals and facts. Secondly, given long-term information, it is further required to obtain information in respect of operable value, objectives and goals' statement. In other words, one can originate information by defining long-term goal, many factors and multiple criteria [Kim,Hong,song,2007], [Theetranot, Haddawy, Krairit, 2007] intermediate goals to account for problem complexity, independent goals, operable goals, interdependent goals, ranking and prioritization and conflicting goals.

6. DEVELOPING IT

The decision mile-posts D0-D22 helps in developing the multi-layered topology, by identifying the information variables at each stage, which is recognized as information origination. The designer continuously, pumps information until the IT's I*I value reaches one. I*I value is 'one' means that the information is perfect and complete as per that particular solution. If the value calculated is 0.8 then the risk, this IS faces is 1 - 0.8 = 0.2.

7. THE IT PLANE AND THE ACQUISITION CYCLE

Need is for developing database, given complex and changing environment and

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requirements [Khurana, 2005]. This calls for database model adjoined by acquisition and utilization cycles. In abstraction, these cycles are information evaluation cycles, information evaluation implying information origination and testing against predefined standards. The traditional database models which are basically information storage and retrieval facilities do not emphasize information evaluation, for them the information once stored is good for future use. This is the cause of many errors as the context changes the information also loses its integrity.

Acquisition cycle evaluates information from the designer or the supplier end so as to deliver flexible information decision for customer satisfaction with competitive advantage. It covers IS and information corresponding to decision processes, D0-D22. Acquisition Cycle is an information origination and evaluation process which improves integrity of data model, by assimilating data/information elements from the IT to develop information network (interconnection of data elements in an information topology plane) with the help of decision mileposts (D0-D22). These decisions mileposts are categorized under the following layers namely, Problem Information, Problem Environment Information, Alternative Information (fig 3.6)

8. THE IT PLANE AND THE UTILIZATION CYCLE

At the end of the acquisition cycle, quality assurance process and functional processes the product is delivered to the customer. For example, the course is designed for a particular degree, and the teacher teaches it. Now, it is equally important that the student cooperates with the teacher in course delivery. This example conveys that the customer is an active entity with of the IS delivered. Utilization Cycle recognizes that the customer has her own information processing and would use the product as per her convenience. Keeping this in mind the UC contains all the decision mile post from D0-D22 , giving flexibility to the customer to operate within the confines of the designer boundary. Integrity of this UC must also be ensured.

9. CASE ILLUSTRATIONS OF IBMS REQUIREMENT IN PRODUCTION AND DISTRIBUTION

The production environment on account of facing uncertainties due to 5Cs at each level in the organization is exposed to information bases at each level which might be without integrity. The uncertainties identified at various levels could be due to the following reasons.

10. UNCERTAINTIES TRADITIONALLY IDENTIFIED IN OPERATIONS

a) Uncertainty in input: Environmental (external and internal) factors may lead to irregular but continuous variations in the quality of informational input and quantity of physical input. Thus there is a need for consistently maintaining integrity.

b) Uncertainty in process: Environmental (external and internal) and parametric changes may lead to process failures. Thus there is need to consistently maintain process integrity.

c) Uncertainty in output: Environmental factors (external and internal) may lead to error prone delivery to the customer. Thus there is a need to check the output mechanism continuously to maintain output integrity also.

11. UNCERTAINTIES ON ACCOUNT OF APPLICATION INTEGRATION

Even as plant operations emphasized first level controls for individual production machines ,with the advent of computer technology ,further impetus on automation initiatives came in the form of higher level process controls [ref fig 3.9].Specifically these were ‘applications’ of computerized information systems justified initially on the cost reduction aspect of processing of periodic and structured information only other choice being the clerical activity later as management tools for planning direction and control

Each of these ‘applications’ had data/information supporting them. The issue was of uncertainties on the computerized information systems, and hence of uncertainties in the information bases attached to these ‘applications’. Also the fact that information once stored needs to be reviewed continuously. Thus there were uncertainties identified on account of:

a. Lack of standardization

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b. Information overload
c. Infrastructural issues and accidental/intentional failures.

12. REASONS FOR UNCERTAINTIES IN INFORMATION BASES AT VARIOUS LEVELS OF PROCESS CONTROLS

a. When traditional enterprises were in for competitive advantage, they sought to produce only 'standard' product in high volumes with low costs wherein the emphasis was on integration minimization. As a result the plant operations came to be dominated by individual production machines for which automation naturally started at the first level where controlling action can be automatically generated on the basis of fairly simple considerations pertaining to the process state. This called for measuring process variables such as pressure flow, level, position voltage etc. Thus uncertainties were introduced on account of measuring process errors.
b. The process control levels 2 & 3 deal with managerial decisions at the middle level. The information bases at these levels are characterized by uncertainty due to incomplete knowledge of system dynamics due to judgmental errors at the human–IS interface. Information needs to be continuously identified and acquired for maintaining integrity
c. The process control levels 4 & 5 deal with higher level management decisions. These levels are characterized by a large amount of human machine interaction. The information in
.
the information bases at this level is thus exposed to environment of human decision making leading to many types of uncertainties which are a feature of human behavior. Information needs to be continuously identified and acquired for maintaining integrity.
d. While automating the production process at the 5 control levels above it has not been possible to optimize continually as a basis for production line delivering mass customized products for continually changing business environment with emphasis on integration across supply chain. This level is based on the information collected from real world observation of events. Hence these are naturally characterized by numerous uncertainties and constant changes in the information base.

Thus it is apparent that there is uncertainty at each level of information and control system that then leads to errors in business process IS view resulting in loss of integrity at the data processing stages, thereby rendering data and information processed inaccurate and making the information bases also inconsistent., inaccurate and unreliable not only in terms of content but also in terms of design. Figure (3.9) gives a model of a business process IS view describing a generic business process integral to an information and control system for a business environment and information bases therein characterized by uncertainty.

Thus it can be emphasized that there is a need for an information base design with integrity at each decision stage (D0-D22 as discussed above) of the production process. Fig 3.9 depicts the same

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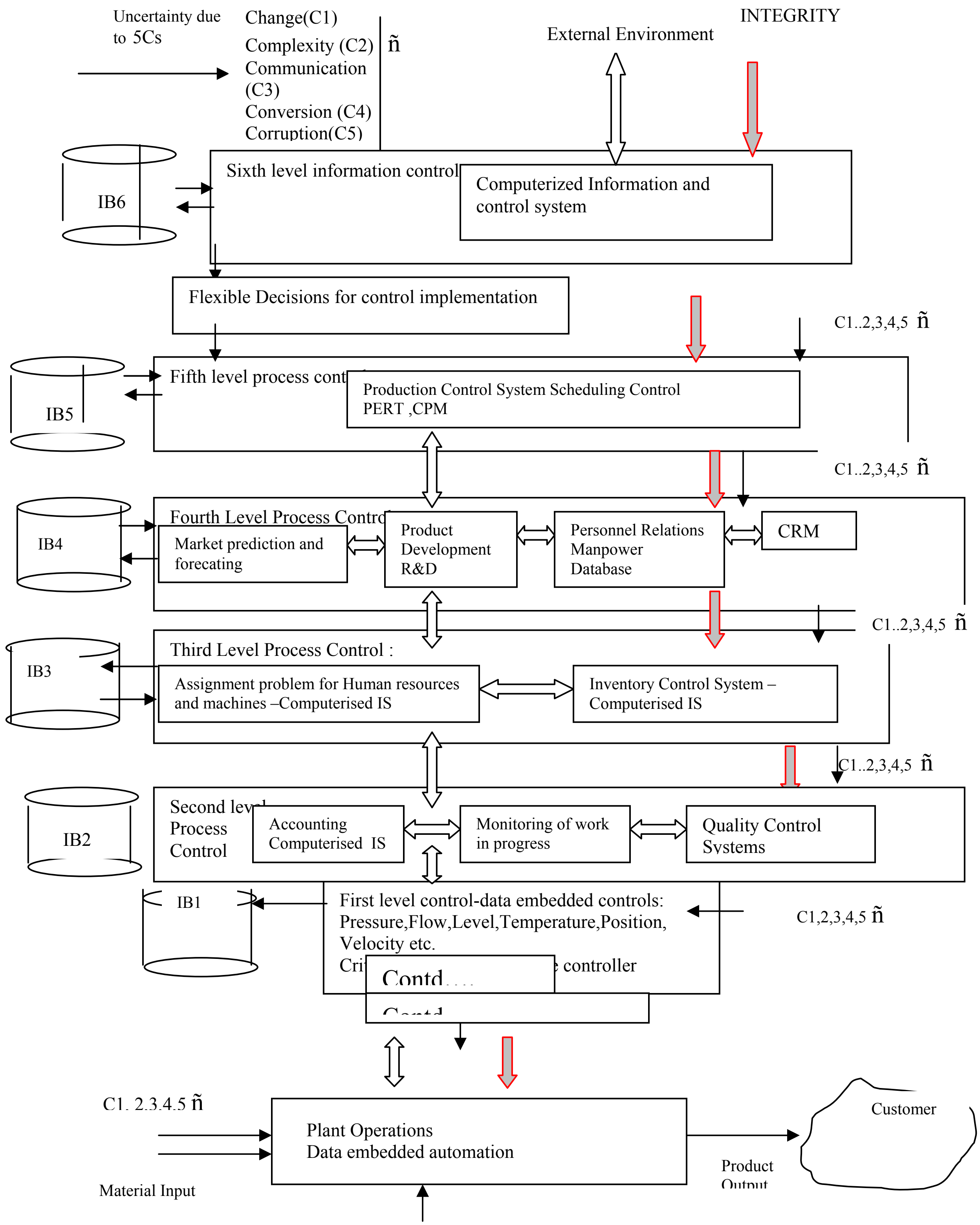

The IBMS for a Production Distribution System

Fig 3.9: Business process IS model describing a generic business process which is closely integrated with the Reference Information bases. Also the whole IS and IB environment is characterized with uncertainty and has its own Information Integrity implications

IB i: Reference Information base at the ith level

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13. THE INFORMATION TOPOLOGY PLANE

The Information Topology Plane for any production distribution system should consist of all the data elements in the context -

- Plant operations/machinery status.
- Pressure, flow level, temperature, position, velocity etc.
- Monitoring of work progress, quality control systems, computerized accounting.
- Assignment problem of human resources and machines
- Inventory Control System
- Market prediction and forecasting
- Product development, R& D
- CRM
- Production control system scheduling control
- Computerized Information and Control System

Attributes of Information Topology Plane

The attributes of an Information Topology plane as explained above are the environment, informational requirements and the (I*I rules) decision stages. In case of a production distribution system these attributes would comprise of the environment of all the data elements in context as shown above. Data element is the smallest unit of identifiable information in a system, for example, people, machine, norms, legislations, rules, policies etc. In order to capture the environment of the data elements the designer would need to capture the factual as well as the normative information. Factual information is the set of facts related to a data element and normative information is the contextual information about a data element, for example, in case of supplier his name could be the factual information and his financial condition could be the normative information. What normative information needs to be originated is determined by the requirements and the decision stages. For example the requirements can be mapped to decision stages[Yu, Chianglin, 2006] [Huang, Kao,Li, 2007] [Salieh, 2007] as follows:

D0: Obtaining current production capabilities of the plant

It is important to identify how much the plant can produce in a unit time. How often the maintenance needs to be done? What is the cost? What is the distribution cost? What is the vendor network? How reliable is the vendor network? What are the logistics involved?

D1: Long term goal set of the production house, supplier, customers, employees and every other stakeholder in the system. These long term goal sets will then transform into negative/positive goals. For example if the long term goal set of any production house is to be an international player then how has he positioned himself for the same, would he be ready to look into his internal processes, control the manufacturing prices, quality of the product etc.

D2: Transforming negative goals in to positive goals

In case the production house has a long term goal set of being the most profitable brand, and it is targeting to do it by underpaying its employees, it is a negative goal set. and it needs to be made into a positive goal set. Transformation into a positive goal set would mean originating information pertaining to optimizing the current employees salary, optimizing the production cost and the selling price depending on the vendor network.

D3: For positive goals identified setting intermediate goals.

If the positive goals identified are as indicated above then the intermediate goals need to be cited as well. Thus if the positive goal is optimizing current employees salary then an intermediate goal could be to check the qualification and experience of all the employees in an organization.

D4: For the problem solving situation, identifying environmental anomalies or malfunctions that will emerge with delay.

This decision stage could deal with the problems in the machinery which may possibly emerge due to over usage, the issue could be related to the equipment or personnel resources. The resources may dwindle for many reasons over a period of time.

D5 - Given the malfunctions that will come with delay, determining what must remain unchanged, i.e., identifying environmental anomalies that must not occur in the process of problem solving

Complete break down of the production unit is an anomaly which should not happen in the process of problem solving. In case it is anticipated than a back up needs to be maintained for the same. Another environmental anomaly which needs to be avoided is a break down of the vendor network.

D6 - Based on (D5), delineating multiple goals to make implicit problem solving goals explicit.

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In case of D5 the fact that the environmental anomaly of the equipment breaking down needs to be avoided, this entire goal needs to be broken down to ensure that the implicit goals in the process are clearly outlined. The explicit goals in this case could be:

i. Identify a maintenance mechanism of the equipment
ii. Identify the maintenance cost.
iii. Identify the maintenance vendor
iv. Identify the maintenance process

D7 - Based on Specific Goals (D1), (D3), (D5) and (D6), determining many factors and multiple criteria

i. Many factors multiple criteria affecting D1 could be the other producers in the same market, unique selling proposition of the product, process standard being followed in the production house.
ii. Many factors multiple criteria affecting D3 could be the number of employees in the organization, different levels at which they work, the industry standards for remuneration
iii. Many factors multiple criteria affecting D5 could be what is the cost of deploying a back up machine, an alternate vendor network etc

In a similar way the desired number of decision stages need to be spanned for all the data elements in the information topology plane.
All these decision stages will originate information within the acquisition cycle of the Information Topology plane. Similar decision stages need to be spanned for the utilization cycle.
All the information originated thus would populate the Information Base Management Systems at each level.
The ensuing decisions in presence of all this information would be with a higher Information Integrity level. This can be measured by the reducing errors in the Error Information Base shown in fig 3.2, 3.3 and 3.4.

14. CONCLUSION

In the scenarios discussed above the need for information base design which preserves integrity has been brought out. It has also been shown that the traditional database design along with acquisition, utilization cycle and resting on the information topology plane would form the basis of this information base design which preserves integrity as well. These information bases would contain the decision stages D0-D22. These decision stages actually comprise I*I rule set. The need and the sample implementation of the Information Base Management System has been shown in the production distribution system.

REFERENCES

[1]. Eskandari, Rabelo, "Handling uncertainty in the analytic hierarchy process: a stochastic approach", International Journal of Information Technology & Decision Making 2007, Vol: 6 Issue: 1 pp 177 – 189, World Scientific Publishing Company.

[2]. Kim, Seok Hong, Song,"Multi-attributes-based agent negotiation framework under incremental information disclosing strategy", International Journal of Information Technology & Decision Making, 2007, Vol: 6 Issue: 1 pp 61 – 83, World Scientific Publishing Company

[3]. Theetranont, Haddawy, Krairit, "Integrating visualization and multi-attribute utility theory for online product selection", International Journal of Information Technology & Decision Making, 2007, Vol: 6 Issue: 4 pp 723 – 750, World Scientific Publishing Company

[4]. Yu, Chianglin, "Decision traps and competence dynamics in changeable spaces", International Journal of Information Technology & Decision Making, Year: 2006 Vol: 5 Issue: 1 pp 5 – 18, World Scientific Publishing Company

[5]. Huang, Kao, Li, " Decision on Enterprise Computing Solutions for an International Tourism", International Journal of Information Technology & Decision Making,
Year: 2007 Vol: 6 Issue: 4 pp 5 – 18, World Scientific Publishing Company

[6]. Salieh," A systematic approach for the selection of business processes for e-enablement", International Journal of Information Technology & Decision Making,

Vol. 16 No.2 June , 2010 pp [160 - 173]

ISSN: 1817-3195 / E-ISSN: 1992-8615

Year: 2007 Vol: 6 Issue: 4 pp 649-689, World Scientific Publishing Company

[7]. Mandke V. V. and Nayar M.K., "Information Integrity Imperative for Competitive Advantage in Business Environment characterized by Uncertainty", in *Information Technology for Business Management*, *16th World Computer Congress 2000*, Beijing, China 2000, pp. 115-125.

[8]. Moray N., "Error Reduction as a Systems Problem", Human Error in Medicine, Edited by M.S. Bogner, USA: Lawrence Erlbaum Associates, Publishers, USA 1994.

[9]. Vijay V. Mandke and Madhavan Nayar, "Information Integrity – A structure for its definition ", in *Conference on Information Quality proceedings* edited by Diane M. Strong and Beverly K. Kahn, MIT, Cambridge, Massachusetts, USA, 24-26 October, 1997, pp. 314-338

[10]. V. Rajaraman, "Information Integrity – An Overview", in JNCASR and SERC Discussion meeting at IISc campus ,Bangalore on Information Integrity issues and Approaches, Edited by Rajaraman V and Mandke Vijay V ,New Delhi: Information Integrity Foundation ,1995

[11]. Vijay V. Mandke and Madhavan Nayar, "Cost Benefit Analysis of Information Integrity " in *International Conference on Information Quality Proceedings*, edited by Craig Fisher and Bruce Davidson, Cambridge, Massachusetts, USA.,2002.

[12]. Hoffer, George and Valacich, Modern System Analysis and Design, 3rd ed., Prentice Hall, 2002

[13]. Vijay V. Mandke, Madhavan Nayar and Kamna Malik," Information envelope and its Information Integrity Implications", in *Sixth International Conference on Information Quality Proceedings*, Edited by Elizabeth M. Pierce and Raissa Katz-Hass, Cambridge, Massachusetts, USA, 3-4 November, 2001

[14]. Reema Khurana, "Information modeling for achieving integrity in databases for open systems", Paradigm vol IX no. 1, pp 56-61 , Jan-Jun 2005

[15]. Reema Khurana, "Information modeling for achieving integrity in databases for open systems", in *Business Information Management Conference* Proceedings, Edited by Dr Goyal and Dr. Malik, IMT Ghaziabad,2005

Vol. 16 No.2 June , 2010 pp [160 – 173]

ISSN: 1817-3195 / E-ISSN: 1992-8615