Fifth Joint Conference on Information Sciences
Computer Science and Informatics
February 27 – March 3, 2000, Atlantic City, NJ

Capturing Corporate Philosophy: The Future of IT

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Abstract

Context is proposed as a mechanism for organizing Information Technology practices in the future through its role in interpretation. An enterprise organization model based on decision-flow is presented here that is applicable to a variety of domains. It contains elements that mark the information content with respect to a full consideration of its environment. These elements are, in order of increasing superiority, data, information, knowledge, judgement, and philosophy. There are four marked stages where contextual derivation occurs among these elements, including definition, refinement, improvement, and realization. Discovery occurs during the derivation of context and it is at this time that higher-level processes influence subordinate processes. For this reason, it is believed that corporate philosophy can be infused explicitly throughout enterprise practices. The resulting organizational model can be used by an enterprise to strategically allocate resources and maintain competitive advantage.

The Knowledge Revolution

The successes of Information Technology (IT) and the advent of the knowledge revolution give us reason to take pause and examine the role of information technology in the corporate enterprise and contemplate the role information will play in the future. The scope of this discussion is applicable to a large audience: from engineering-related disciplines, to the medical field, to psychology. The authors' background is that of engineering design and specifics from that domain will be cited.

It has been said that the surge in information capability since the 70's has been of more importance than the proliferation of computers themselves.[1] Some general areas marking key advances in the representation of information are shown in Figure 1. These lead us to the current knowledge revolution. Caution is strongly encouraged at this juncture as enterprises shift to knowledge-based thinking because often the term knowledge is incorrectly used synonymously for information. This leads to the misclassification of IT tools as done in a recent InformationWeek research survey.[2] It is important to unambiguously distinguish the role of information and knowledge and the tools used to manipulate them. Discussions in a recent article in IEEE Computer supports this need.[3] Pitfalls of current knowledge management thinking are highlighted in the article and attention is shifted to the need to define organizational principles within a corporate enterprise. The ability to direct the role of IT in the future will strategically allow corporate America to maintain a competitive advantage through "constant improvement".

This leads one to question:

> *What underlying component permits resources to be strategically organized in an enterprise and can this be used to direct resources to maintain competitive advantage?*

The authors assert that context provides one such organizational mapping. Context not only serves to define and organize resources but ensures that corporate philosophy guides all actions in an enterprise. The goal of the summary presented here is to provide a medium for presenting a look at the role of IT in enterprises in the future and to provoke insight and questions that lead to novel advances in the field.

A Model for Corporate Philosophy

Significant bodies of research and practical knowledge exist in information science as a whole. These cover modeling, utilization, creation, cognition, and a variety of other aspects. Distilling this body of research, the

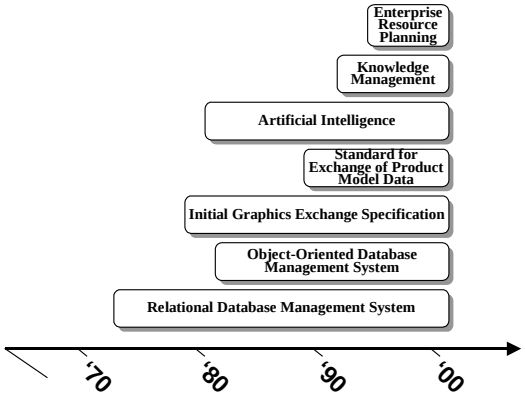

Figure 1. Information Technology Focus Areas

authors find that context is an underlying concept that is prevalent in information systems and is considered here in more detail in hopes of providing a model for the organization of an enterprise.

Model for Decision-Making

The authors approach the development of such an organization from an engineering design decision-making perspective, which relies heavily on the management of information. In this domain, the description of the activity of designing is described by some as "a process of converting information that characterizes the needs and requirements for product into knowledge about a product".[4] Researchers have examined this description to find ways to provide simplicity and independence in hopes of finding elegant product solutions.[5] Here, the concepts that information is related to knowledge and the formalism for navigating this relationship are borrowed for the decision-making model to be proposed.

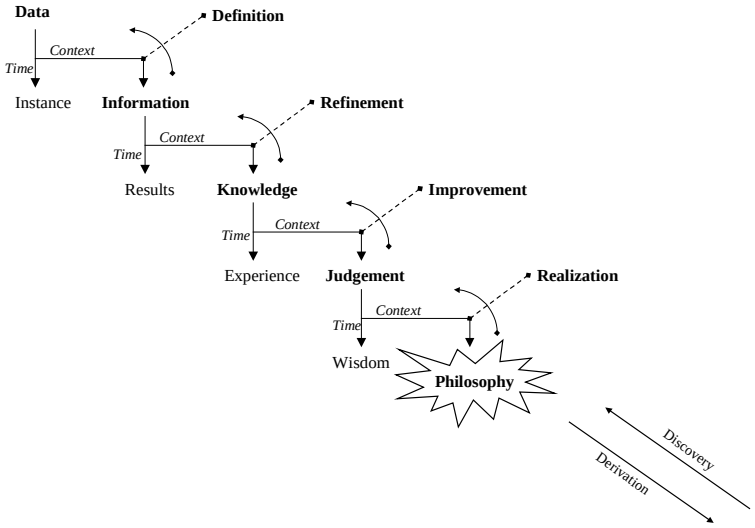

Figure 2. Model for Enterprise Decision-Making Flow

Decision-making goes beyond the simple transformation just described because the transformation does not include room for other design elements such as data and does not describe how knowledge (lessons-learned) can be used in future transformations. In response to these limitations, a decision-making organizational model is proposed here based wholeheartedly on the notion of contextual derivation – one element of which is knowledge gained by relating pieces of information. Context is defined here to be the set of items that facilitate interpretation. It includes such things as numerical comparisons, time, and individual perception. As mentioned earlier, information and knowledge are just two elements of decision-making at work in corporations. A strawman for a complete organizational model is presented here for the first time and is represented in Figure 2 as a decision-making flow. The model has two main components that capture its dynamics:

Derivation. Contextual development as represented by flow downward along the main diagonal

Discovery. Influence of superiority on the derivation process as represented by flow upward along the main diagonal

These elements will be described in detail next.

Derivation

The organization depicts the contextual derivations from individual data elements to philosophy. Details of individual derivations are shown in Figure 3. At each step in this organization are elements that mark the content derived with respect to a full consideration of the environment. These are data, information, knowledge, judgement, and philosophy. Contextual derivation occurs in four distinct stages, which are definition, refinement, improvement, and realization. This model significantly expands the definition of designing given earlier that focuses on conversion. Here, actual contextual derivation is considered. Examples of contextual derivation for a wing definition are given in Table 1. The four stages of the proposed model are shown on the left and specific actions done by designers are given at the right. Various tools assist in the discovery process and are presented in the table for illustrative purposes.

The temporal component of contextual derivation is explicitly separated in this model from other components in the organizational structure. The temporal elements include instances, results, experience, and wisdom and are shown on the left diagonal in Figure 2. Temporal elements play an important role in the proposed organization because

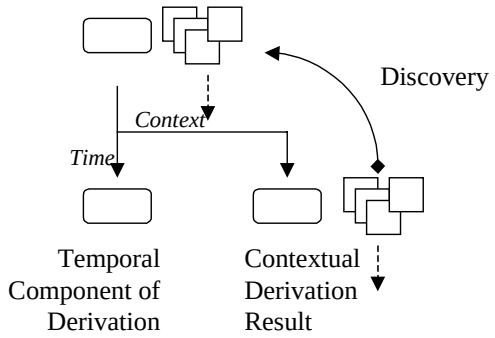

Figure 3. Model of Contextual Derivation at a Particular Stage

Table 1. Examples of Contextual Derivation

Stage	Derivation	
Definition (Data→Information)	Action:	Assigning data to a specific product or project given all enterprise data. For vehicle design, a single, geometric model may form the central information model from which analysis models are derived.
	Tools:	Search engines, enterprise servers, historians, and navigation
	Example:	Wing Skin 128-00-61 B Belongs to General Aviation Airframe128
	Context:	Product identification numbers
Refinement (Information→Knowledge)	Action:	Engineering evaluation of product-relevant information.
	Tools:	Accumulation, sensitivity analysis, and global interrogation
	Example:	Wing Skin 128-00-61 B costs a certain amount to produce if made from Aluminum and certain amount if produced from Composites
	Context:	Economic analysis of wing skin
Improvement (Knowledge→Judgement)	Action:	Conditional refinement of product alternatives leading to a single outcome.
	Tools:	Soft-computing techniques, comparative techniques (optimization, trade studies, preference analysis)
	Example:	Use Aluminum wing skins in the manufacture of General Aviation Airframe128
	Context:	Aluminum wing skins cost less than composite wing skins
Realization (Judgement→Philosophy)	Action:	Successful product design strategy that maintains competitive market share.
	Tools:	Corporate strategy, management and planning tools; cognitive tools
	Example:	Lower cost and easier maintenance are better for affordability
	Context:	Affordability is a key driver for the decision to purchase a general aviation aircraft

time continues to be a driving factor in design. Many decision-making tools (such as forecasting, planning, etc.) are time oriented.[6,7] Also, reduction in design cycle time will aid in bringing a product to market faster.

Discovery

Discovery also occurs during the derivation of context and it is at this time that higher-level processes influence subordinate processes. The discovery process is illustrated to the right in Figure 3. For instance, previously generated knowledge can also provide context during the creation of new knowledge during the refinement process. This leads us to a new principle. *Discovery provides a vehicle whereby corporate philosophy can trickle down to all IT activities within an organization.* The rightmost arrows leading up the diagonal to the right in Figure 2 emphasize this impact. This has several profound effects. Foremost, a philosophical model exists that propagates to interactions concerning individual data elements.

It should be noted that discovery does not necessarily occur during the contextual derivation process as exemplified by the cases of original and revolutionary design. Consider emerging engineering systems such as magnetic levitation vehicles or fuel cells in which their novelty leaves little room to apply lessons-learned from prior designs and their practices.

Using The New Organizational Model

It is hoped that the organizational model used here will provide a roadmap for future IT planning efforts. The model has a number of significant implications that are made possible as the model matures.

Corporate Philosophy

This new model makes it possible for corporate philosophy to be formally learned, dictated, or some combination of the two. New philosophy can be learned through the induction or deduction processes as contextual derivation occurs in the elements, from data to judgement. Its transposition is that philosophy propagates through the organizational scheme through discovery processes that occur as higher-level action impacts their subordinates. Realizing that these processes occur, organizations can focus on providing product impact during discovery or derivation. Thus product performance, development, and marketability is streamlined by not allocating resources elsewhere.

The authors recognize that there are significant efforts already in place at corporations to effect modern business philosophies. An example includes the Six Sigma efforts at General Electric (Greenbelt), Rolls-Royce Allison ("Better Performance Faster"), and other entities.

Resource Allocation

The new scheme was originally postulated as one method for organizing existing and emerging tools that are available in Enterprise Resource Planning (ERP). There are so many tools that confusion often arises as to which is the most appropriate to use at certain design points. In addition, information tools are inappropriately cast as knowledge processing tools to remain current with the latest catch phrases. The proposed scheme provides exactness about tool use and subsequent resource allocation. The list of “Knowledge Management” tools mentioned in the InformationWeek article has been re-categorized based on the ideas presented in this paper and are shown in Table 2.

Table 2. Tool Organization
(Adapted from Ref 2)

Tool	Model Element
Relational Database	Data
Intranets	Any
Data Analysis Tools	Information
Text or Document Search	Data
Groupware	-
Data Warehouse	Data
Data Mining Tools	Information
Web Portals	-
Customer Relationship Management	Judgement
Expertise Profiling	Judgement
Enterprise Resource Planning	Any
Expert Databases or AI Tools	Knowledge or Higher
Group Memory or Context Management	Knowledge or Higher
Teamware	-

Dynamics

A characteristic of the organizational scheme is that it is dynamic in nature. It is designed to permit multiple entry and exit points and iteration. For example, a group of designers may be exercising computer-aided design tools to generate information during detailed design, while committees are forming to award contracts and plan for manufacturing. The organization deals explicitly with information that is always changing. In addition, all elements are considered to be important and are never discarded. Mistakes or failed design decision-making paths are also considered during the establishment of philosophy.

Elements from one organizational structure can also transition between structures. For instance, common part data is often used between product families. Similarly, a common philosophy may guide all product design within an enterprise.

Research of the Model

As the proposed model matures, the need arises for new research and tool development to handle different derivation and discovery processes. This is expected in particular with respect to the higher-level elements such as judgement and philosophy. The following are several research areas that have been identified.

Context Definition. Context is defined in the scope of this paper to be items that facilitate interpretation. Context is related to other areas such as uncertainty modeling and a more formal study should be pursued.[8]

Stage Identification. There are four stages in the proposed model (definition through realization) in which decision-making is to occur. Methods for identifying the type of decision that will be made must be developed so that appropriate tools and context are presented to the decision-maker with maximum efficacy.

Tools for Derivation and Discovery. New tools are emerging every day that fit into the proposed model, such as data mining and knowledge centers. It is important to look ahead to see how judgement and philosophy will be exercised in the model so that appropriate tools are researched and developed.

Cross Domain Fertilization. As postulated earlier, the proposed model has applications to a number of different domains. If this can be validated, the model lends itself to quick transfer of tools, technologies, and products across a variety of domains. For example, profiling tools from the consumer market can easily transition into engineering as a method for rapid supplier identification and part specification retrieval.

Philosophy Inadequacies. As examples of the organization model were constructed, the need for sound philosophies was realized. A seemingly obvious goal; however a method exists here to formally describe a philosophy and how it impacts decision-making. It is imperative that a philosophy includes a sufficient number of metrics to capture the elements necessary to exercise *good* judgement, which trickles down to a product definition through discovery processes. Incomplete models, those that lack philosophical metrics, lead to poor judgement. These relations will be explored further.

Tools that result from this research are expected to have high commercial payoffs in a variety of domains.

Summary

An enterprise organization model is proposed where IT practices can be categorized and streamlined. The model promotes discovery during contextual derivation. This process permits the influence of superior processes such as philosophy and judgement to influence underlying IT practices such as information and knowledge processing.

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