ACCELERATING PRODUCTIVITY OF INTELLECTUAL ORGANIZATIONS BY SYSTEMS METHODOLOGIES

by

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ABSTRACT

Intellectual organizations are those organizations (large or small) that work primarily with ideas, such as universities, corporate research and development departments, research institutes, legislative bodies, public policy institutes, and trial juries. The productivity of such organizations can be accelerated significantly, and can reach new levels of accomplishment in all those areas where their work is sufficiently complex to require teams of people working together on particular products.

How to Accelerate Productivity. Productivity in intellectual organizations requires that two kinds of organizational activity be significantly improved. These are: (a) **management** and (b) **product modeling**. Improvement in modeling requires that improvements in management be made first, but improvement in management must be guided by what is known about improvement in modeling. To improve these two kinds of activity, here is what must be done:

- Learning. Organizational leaders must become familiar with the newly-developed science of complexity, and its implementing, intermittently-applied management system called "Interactive Management".
- New Roles. New organizational roles must be defined and filled with newly-trained actors who are capable of filling these roles. These new actors operate by learning how to apply the science of complexity, using the process of Interactive Management, and controlling the quality of the process according to the requirements of the Laws of Complexity.
- Special-Purpose Facility. A special facility must be constructed, following the DEMOSOPHIA situation room design, in order to make the facility support increased group intellectual productivity.
- New Management System. Actors who fill the new organizational roles must collaborate with

persons who are experienced in the intermittent use (as-needed) of Interactive Management, in order to install this system in the organization.

- Increase in Structural Modeling. Using the new system, a significant increase in the amount of structural modeling should be initiated, in order to provide an adequate basis for the always-present numerant modeling going on in the organization. The new structural models should provide the basis for context understanding, strategy development, product development and, in general, the management of complexity throughout the organization.
- Higher-Education Reform in the Longer Run. In the longer run, higher education must accept the requirement to offer ways for learners to cope with complexity, using methods that are open at scale.

Examples of Acceleration. Here are two **examples** of how modeling can be improved. Early in 1994, a major corporation conducted a 4-day workshop, using the system called Interactive Management. The purpose of the workshop was to develop a strategy for designing and developing a Product Information Management System. In four days, the multi-function team identified the likely problems to be faced in moving ahead, produced a problematique showing how these problems are interrelated, a sequence chart showing deliverable dependencies, and a set of task statements showing what had to be done cooperatively to produce the deliverables. Similar projects have been known to require a significant part of a year to complete, using normal methods. A decade earlier, a group of over 160 people met to construct a plan for the future of privately-owned forestry land in the United States to the year 2,010. Again requiring four days, similar results were achieved, identifying what five different bodies (several levels of government, private citizens, and consultants) needed to do cooperatively in order to achieve the desired results. In the time between these two projects, several hundred other projects demonstrated similar productivity accomplishments.

Required Improvements in Modeling. All aspects of creative activity in an intellectual organization can be described as modeling of one type or another (consistent with the modern science of semiotics). Modeling in large organizations is almost totally driven by intuition, and is therefore lacking in careful treatment of the underlying logic of models. Virtually everything that is learned about models in higher education is inadequate to comprehend its subtleties, and inappropriate to guide effective modeling. One of the major reasons for this is that higher education teaches its clients how to model at small scale; and when the clients move into constructive social roles, they mistakenly extrapolate what has been learned about small-scale activity into large-scale arenas. This practice of ill-considered extrapolation has to be stopped and replaced with the use of processes that are open at scale.

Improved modeling is needed for both **structural** and **numerant** models. **Structural models** (widely ignored in higher education) portray the underlying relationships involved in all kinds of systems work, whether to describe or diagnose an existing system or to conceive, design, and implement a new system. **Numerant models** (overstressed in higher education) provide for computation and assignment of numerical values to system attributes. Numerant models depend upon the underlying structural models for their quality, and past failure to develop adequate structural models explains why many numerant models yield misleading results.

The development and application of numerant models causes many major mistakes to be made, typically as a result of developing numerant models based in unarticulated and incorrect logic.

Intellectual organizations should stop constructing numerant models until they learn how to construct efficiently the underlying structural models, and proceed to develop them and maintain them for ready reference.

Structural models are developed based upon an understanding of the categories of relationships that are significant. The development of structural models by groups offers many advantages to organizations, going well beyond the models themselves, and extending into improved communication in the organization, and a quality of life in the organization that is dramatically improved due to increased pride in effective performance.

To understand the theory of structural modeling, it is necessary to delve heavily into those branches of mathematics associated with logic models as opposed to numerant models. These branches include: combinatorics, set theory, theory of relations, lattice theory, partition theory, ordinary and extended Boolean algebras, Boolean matrix theory, Boolean recursion equations, Boolean inequalities, digraph theory, theory of crossings in map layouts, inference theory, the theory of relationship embedding, and iterative array mapping.

Structural models provide outstanding conceptualization of context from which to approach major issues, numerant model development, and detailed design activity.

Required Improvements in Management. Intellectual organizations account for virtually all human creativity and productivity that involves complex systems. Yet their performance is adversely affected by inadequate management of the **four critical components of performance**: context, process, content, and human behavior.

Productivity in intellectual organizations can be very significantly enhanced if the various **factors** involved in these four critical components are properly managed.

All four of these critical components and the various factors that are involved in the adverse impact on organizations have been carefully studied. It has been found that in those organizations that are both reasonably successful and large, the complexity of managing these critical components is significant; requiring that **a science of complexity** be developed and applied to construct a **strategy and a management system** that can overcome the adverse effects of the factors involved in these critical components.

The development of the science of complexity during the past two decades included the discovery of **17 Laws of Complexity**. These Laws explain low productivity and reveal the means of attaining substantial improvement in organizational productivity.

Requirements stemming from study of the Laws are of two basic types: (a) new organiza- tional roles must be defined and filled with well-trained actors and (b) actions must be carried out through these new organizational roles to provide the necessary organizational corrections.

Summary. Virtually all of the knowledge required to make the necessary organizational changes is

incorporated in the science of complexity, and further illustrated in the science of generic design, first published in 1990, and in the management system called "Interactive Management", developed over a 14-year period, and tested in many applications.

The basis for improving productivity in working with ideas concerning complex systems in intellectual organizations has been developed, tested, and awaits informed management action to incorporate the necessary conditions into their organizations.

- Kant defines "enlightenment" (Transparency #22)
- The beginning of enlightenment (Transparency #20)
- The beginning of discovery (Transparency #25)

PART 6. REMODELING AND COMPLEXITY

- Shared linguistic domain (Transparency # 24)
- Levels in design thinking (Transparency #8)
- Inadequate linguistics (Transparency #9
- Heavy demands on process

PART 7. REASONS FOR POOR INTELLECTUAL PRODUCTIVITY

- Boulding's Reasons (Transparency #3)
- Other (Type 1) Reasons (Transparency #7)
- Other (Type 2) Reasons (Transparency #10

PART 8. ACCELERATING PRODUCTIVITY IN ORGANIZATIONS

- High-level focus on process (Transparency #29)
- Process managers scattered throughout the organization (Transparency #30)
- Domain of Science Model requires feedback to system scientists from implementers (Transparency #31)

WHAT FOLLOWS IS an APPENDED MANUSCRIPT containing NOTES AND TRANSPARENCY LIST USED FOR THE TALK:

OUTLINE OF TALK IN MEXICO CITY--OCTOBER 21, 1994
ACCELERATING PRODUCTIVITY IN INTELLECTUAL ORGANIZATIONS THROUGH SYSTEMS METHODOLOGIES--JOHN N. WARFIELD

PART 1. GOALS.

- To convince you that situational complexity is a major source of low productivity
- To propose a way to overcome complexity and enhance productivity
- To convince you to adopt a new behavior when faced with a complex situation

PART 2. ORDINARY AND COMPLEX SITUATIONS

- A scale of complexity
- A threshold region on the scale
- Above the threshold region = a complex situation
- Below the threshold region = an ordinary situation
- How to study complexity (Transparency #6)

PART 3. LANGUAGE AND COMPLEXITY

- Problematique (Transparency #21)
- Linearity of Prose (Transparency #27)
- Parallelism of Prose (Transparency #28)
- Necessity for Structural Thinking (Transparency #23)
- Procrustes

PART 4. GROUP BEHAVIOR AND COMPLEXITY

- Typical group work program (Transparency #13)
- Focus and Function matrix (Transparency #14)
- Laws of Complexity (Transparency #18)
- Spreadthink (Transparency #11)
- Type 2 Voting Results (Transparency #15, X-Y Plot)
- Type 1 Voting Results (Individual Patterns)
- Example Situations and Consequences

PART 5. FRAMEBREAKING AND COMPLEXITY