TITLE: "CREATING AN INFORMATION FACTORY"

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Since 1971: *"Software for the finest computer - the Mind"*

"Q: How many interpretations of systems development are there?
A: How many analysts and programmers have you got?"
- Bryce's Law

INTRODUCTION

Back in the early 1980's, Japan's MITI (Ministry of International Trade & Industry) coordinated a handful of Japanese computer manufacturers in establishing a special environment for producing system software, such as operating systems and compilers. This effort came to be known as Japanese "Software Factories" which captured the imagination of the industry. Although the experiment ended with mixed results, they discovered organization and discipline could dramatically improve productivity.

Why the experiment? Primarily because the Japanese recognized there are fundamentally two approaches to manufacturing anything: "one at a time" or mass production. Both are consistent approaches that can produce a high quality product. The difference resides in the fact mass production offers increased volume at lower costs. In addition, workers can be easily trained and put into production. On the other hand, the "one at a time" approach is slower and usually has higher costs. It requires workers to be intimate with all aspects of the product. Which is the most appropriate approach for a development organization to take? That depends on the organization's perspective of systems development.

ART VERSUS SCIENCE

There are those who believe systems development to be some sort of art-form requiring peculiar knowledge and skills to perform. There are significant differences between an "art" and a "science." An "art" depends on an individual's intuitive instincts about a particular subject. Such intuition is difficult to teach and apply in a consistent manner. An art-form, by definition, implies non-conformity and represents an expression of personal style and taste. In contrast, a "science" is based on proven principles and, as such, can be taught and applied in a uniform manner by many people.

In order for systems development to move from an art to a science, a body of knowledge has to be defined in terms of proven concepts and standard terminology. Unfortunately, this is where the industry has been wallowing for the last 30 years. The Japanese example reveals it is not necessary to invent any new theories of management, but rather to re-use existing management principles that have already been proven over time. By doing so, they are attempting to move the industry from an art to a science.

FIVE BASIC ELEMENTS OF MASS PRODUCTION

Assuming we want to establish an environment of mass production to develop our information resources, it is necessary to understand its fundamental nature. As any introductory text book on manufacturing can explain, there are five basic elements of mass production:

1. **Division of Labor** - to break the production process into separate tasks performed by specialists or craftsmen. Such division specifies the type of skills required to perform the work.

2. **Assembly Line** - describing the units of work along with the dependencies between the steps thereby defining the progression and synchronization of product development.

3. **Precision Tooling** - for mechanical leverage in developing products.

4. **Standardization of Parts** - for interchangeability of parts between products, thereby lowering costs and shortening development time, and allowing assembly by unskilled and semi-skilled workers.

5. **Mass Demand** - this represents the impetus for mass production; customers demanding standardized and reliable products at lower costs. In the IRM world this is represented by end-users who require standard and reliable systems at lower costs to support their information needs.

The rationale behind mass production is improved productivity; producing more quality products at less cost. Most people fallaciously equate productivity with

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efficiency, which simply gauges how fast we can perform a given task. Effectiveness, on the other hand, validates the necessity of the task itself. There is nothing more unproductive than to do something efficiently that should not have been done at all. An industrial robot, for example, can efficiently perform tasks such as welding. However, if it welds the wrong thing or at the wrong time, then it is counterproductive. It therefore becomes important in the production of any product to define WHO is to perform WHAT work, WHEN, WHERE, WHY, and HOW (we refer to this as "5W+H").

We therefore have long touted the following formula:

Productivity = Effectiveness X Efficiency

It is our belief improved productivity can be instituted by implementing the five elements of mass production and devising a manufacturing facility whereby are found:

Assembly Lines - increments of work sequenced in such a way to develop products. Along the assembly line, a series of tools and techniques will be deployed, some implemented by the human being, others through automated assistance, such as robots.

Materials Management - the business function concerned with standardizing parts so they may be shared and re-used in various product assemblies. Further, it is concerned with collecting, storing and retrieving parts (inventorying) in the most efficient means possible (e.g., JIT - "Just In Time").

Production Control - oversees the assembly lines and materials management, looking for unanticipated delays or accelerations of production schedules. Consequently, corrective action can be taken as required to resolve problems.

These three components establish a "checks and balances" in manufacturing and can also be utilized to develop an "Information Factory" to develop an organization's information resources, whereby are found:

Methodologies (Assembly Lines) - defines the work environment (5W), thereby synchronizing the flow of work. Within the phases of the methodology, a variety of tools and techniques may be deployed defining HOW the work is to be performed.

Resource Management (Materials Management) - identifies and classifies information resources, thereby promoting the sharing and re-using of resources. It also ensures they are collected, stored and retrieved in a timely manner.

Project Management (Production Control) - used to plan, estimate, schedule, report, and control project work.

Why an "Information Factory" as opposed to a "Software Factory"? One of the key failures in the Japanese "Software Factories" experiment was its limited scope. It failed to address all of the information resources of an enterprise, especially business processes, administrative procedures, manual files, printed reports, human and machine resources, business functions, etc. all of which are essential to a total systems solution. The term "Information Factory," therefore, is an admission there is more to information resources than just software.

THE NEED FOR INDUSTRIAL ENGINEERING

The mechanics and infrastructure of an "Information Factory" are fairly easy to grasp, but it requires a special kind of person to implement: an Industrial Engineer.

The American Heritage Dictionary of the English Language (Third Edition) defines Industrial Engineering as: *"The branch of engineering that is concerned with the efficient production of industrial goods as affected by elements such as plant and procedural design, the management of materials and energy, and the integration of workers within the overall system."*

An Industrial Engineer considers the products to be build and employs work study techniques in order to improve productivity. Such a group of people is critical to the implementation of any mass production facility, including an "Information Factory." The Industrial Engineer has to be one part engineer and one part social scientist, studying the behavior of people (e.g., why they work in the manner they do). This is another element missed by the Japanese "Software Factories."

In an "Information Factory" the Industrial Engineer is responsible for:

1. Defining the infrastructure of the factory (methodologies to be used, resource management, and project management). This includes the progression and synchronization of work, along with the tools and techniques to be used (5W+H).

2. Establishing the types of people needed to perform the work, along with the required skill sets (and how to

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evaluate performance). This also includes specifying the types of training required to do the job.

3. Reviewing work products (work sampling) in order to evaluate product quality and production problems, thereby triggering the need for improvement.

4. Constantly looking for new tools and techniques to improve the process. It is generally agreed techniques and tools will come and go, and will evolve over time. As such, the Industrial Engineer is a student of the industry.

EFFECT ON CORPORATE CULTURE

The mechanics of the "Information Factory" are easy to assimilate and implement. The real problem lies in changing the behavior and attitudes of people, specifically, the corporate culture. The goal of an "Information Factory," as it is with any mass production facility, is to develop a homogeneous development environment (as opposed to a heterogeneous environment where everyone is allowed to develop products as they see fit).

To counter the "Tower of Babel" effect found in most development organizations, the "Information Factory" seeks consistency and quality through uniformity and standardization. It is not uncommon for the concept of a factory-like environment to strike fear in the hearts of software developers as they may see it as a threat to their free-spirited individuality. Such an environment need not sacrifice freedom of expression or creativity. It is simply a means to channel such creative energies in a uniform manner.

The biggest problem though rests in reorienting people to believe they are in the business of building products, not just writing code. Acceptance of the "Information Factory" environment can be achieved if people understand the overall process, where they fit in it, what is expected of them, and how their work affects others. We have found most people prefer organization and discipline as opposed to chaos. Further, they can achieve superior results when standards are imposed; such discipline results in uniform and predictable work products,

CONCLUSION

It is possible to employ the same concepts and techniques as used in mass production towards the development of information resources. But creating a "factory"-like development environment takes more than simply calling yourself one. It is a significant reorientation effort. Fortunately, it is not without precedent and the concepts have already been introduced to devise an "Information Factory" based on other engineering/manufacturing disciplines.

The benefits of an "Information Factory" are no different than any other mass production environment: standardization, improved productivity, reduced costs, better change control, faster employee start-up and more effective use of human resources. However, the impact of implementing such an environment should definitely not be underestimated. It affects people's perceptions regarding development and ultimately affects the corporate culture.

In order to move from an art to a science, it is necessary to define and standardize our terminology and concepts for developing information resources. Only when this happens can we teach it to others in a uniform manner and gain the legitimacy as a profession that has long eluded developers.

For more information on our philosophies of Information Resource Management (IRM), please see the "Introduction" section of "PRIDE" at:

http://www.phmainstreet.com/mba/pride/intro.htm#irm

END

"PRIDE" Special Subject Bulletins can be found at the "PRIDE Methodologies for IRM Discussion Group" at:

http://groups.yahoo.com/group/mbapride/

You are welcome to join this group if you are so inclined.