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The Power To Change

Work Process Integration and System Planning

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Introduction

It is a pleasure to visit with you today and I want to thank you for inviting me to address this group. The title I gave for my talk was "Work Process Integration and System Planning." When I was asked to participate in the conference, I was excited. Like many of you, I was busy and didn't have the time to think all the way through the subject. When I sat down to prepare my presentation, I reviewed this title and decided it just wasn't exciting enough.

What I really want to do today is tell you a story. It the story of a journey a couple of my colleagues and I have made over the last 15 years. It is a story of a discovery. The discovery of the "Science of Change." This science is based on some fundamental principles that can have very significant impacts on the way businesses are organized and operated in the future.

History

In 1984 I was working with a consulting company based out of the San Francisco Bay Area. The company's base business was providing engineering services to the Nuclear Industry. At that time we could see that the industry was not going to be able to support the kind of growth rates we needed. We were looking for a way to diversify into other markets. It was during this process that we discovered that Pacific Power & Light was developing a maintenance management application. To make a long story short, we put together a joint venture company to continue the development and to market the application.

In many ways we were ahead of our time. In particular we were among the first to use structured techniques as a consulting tool to analyze business processes. Over the course of the next several years we had some success but in retrospect, we made a bad technology choice.... We discovered that the market was going right and we had gone left. Throughout this period we learned many lessons. I won't go into all we learned, but we did learn a lot about analyzing business processes and implementing software.

Perhaps the most significant lesson was the realization that we could make much better software than the clients could implement. In effect we learned that the real problem was not on the technology side, but on the business side. In retrospect, it is obvious that a different approach is required in order to get significant leverage from Information Technology.

Our base business was to assist clients in managing their physical plants. But we began to understand that there was an administrative obstacle that we had to overcome before we could have an impact on the physical plant. We came to call this phenomenon the two-plant theory.

We are all aware of the physical plant, but there is another plant out there that can cause just as many problems. In fact, this is where most of the challenges lie, not with the physical plant. We can fix the physical plant, if we can only get there.

We began calling this administrative obstacle the Administrative, or Information Plant. It consists of all the people, information systems and other administrative apparatus that exists in the enterprise. It processes the information we need to manage, administer and maintain the physical plant. When we start to deal with business processes and information systems, we are dealing with the Information Plant.

It also became clear that the Information Plant had never really been designed. It just grew up like a weed patch with little if any design or planning. It had been subjected to numerous fixes and patches without the benefit of knowing a base design. It took a while, but it finally dawned on us that if we were to have an impact on the physical plant, we must treat the Information Plant with the same respect as the physical plant. We must learn to apply an engineering-discipline to the Information Plant.

To bring the story full circle, We experienced these lessons during our business venture, but we didn't really learn them until years later. While we came to understand the role of the Information Plant, we didn't really know how to go about dealing with the problem.

As I have noted, our joint venture suffered some fatal errors and it folded after 6 years. My colleagues and I scattered following the breakup, but we continued to communicate and work on the basic problem. We reformed under the umbrella of MetaPower in 1997 and proceeded to package what we had learned over the ensuing years.

We came to realize that if we were to effectively change the Information Plant, we must understand it. We needed to understand the basic underlying principles, we needed to understand the science if we were to understand how to change.

The Science Of Change

We have identified some basic principles that are critical in managing change in the Information Plant:

The Messy World

Perhaps the most fundamental principle is the fact that this is a messy world and just because we can draw nice neat models of how thing fit together does not mean we believe that life is or can be this neat. We recognize that the world is messy and complex. There will always be more names than will fit in the Rolodex. There will always be more things than we can do before noon. There will always be things that don't work just right. There will always be more detail than we can ever deal with.

The Order of Chaos

The Order of Chaos tells us that the "messy world" is really made up of fundamental patterns or structures that interact in an apparently messy manner. When examined in the proper context these patterns can be identified. The issue of models and standards is that they are approximations of these structures and help us understand and deal with the messy world.

They help us sort out the important stuff and discard the trivial stuff. They help us differentiate strategic stuff from tactical stuff. The models help us bring a little order to a corner of the messy world. But we can't be seduced into believing that we can bring order to the messy world.

Systems Theory

There is another principle that is important to successful change. This principle comes to us from Systems Theory. The principle says that systems (enterprises are certainly systems) are made up of individual subsystems and if the overall system is to operate optimally its subsystems will not be operating optimally.

This seems to be against many of the tenets of the way we think about the world. Traditionally, we have thought that the way to make the overall system work best is to make the parts work best. Many enterprises pursue this strategy as an organization principal. In the utility industry, where I have spent a good part of my career, the trend is to give plant managers near total autonomy for the performance of their plants. With little guidance, I might add. If you ask management, they will tell you, "we empower our managers and don't interfere with their decisions." This causes inconsistent performance at best and destroys the ability to leverage common solutions to common problems.

Ignoring this systems principle is one of the main contributors to organization silos. Managers optimize their operations around the incentives given them. Usually this is economic incentives. This drives them to streamline their operation and reduce costs. This seems good and should result in lower overall cost and presumably better overall performance. The trouble is, there are usually things that one organization should do that will drive up its costs and/or reduce its efficiencies. These things are cheaper and more efficiently done here than in other organizations. Thus, when the individual organization is optimized, it drives costs up and performance down in other areas of the enterprise.

What do we do then? We need to develop an organizing structure that tells each component (or subsystem) the performance principles around which it must optimize in order to optimize the performance of the enterprise.

Project Management

Many of the challenges in implementing change lie in the way we define and manage projects. Projects directed at changing an enterprise must have a defined scope and a clear objective.

A common problem with contemporary change projects is that they tend to get caught up with discussions and debates that seem to have no resolution. In all likelihood these projects are attempting to deal with issues that are beyond the authority and charter of the project. This points directly to the need to accurately define and control the project scope. Our experience has shown that these crippling debates are a result of the messy world.

Another project issue is management commitment. Too often, change projects find their way into the ditch because management is not aligned with the objectives. In other cases the project team loses it's focus and drifts to other areas and objectives. Either way, the net result is that the project never accomplishes its intended purpose because management is not willing to back the results.

We frequently find that change projects have difficulty determining the existing state of the processes. It is not unusual for the projects to have overlapping scopes and to be virtually unable to communicate with other active projects.

These symptoms all point to the need for a structured consistent approach to project management.

Change as an Applied Science (The MetaPower Methodology)

At MetaPower we have developed a set of tools to guide the process of changing the Information Plant. This methodology ensures that change projects are properly chartered and stay on track to a successful completion.

MetaPower's Change Methodology is comprised of three structures:

Design Model - To simplify complex issues

Project Model - To ensure project thoroughness and timeliness

Design Technology - To ensure design consistency and communication clarity

Design Model

The Design Model illustrates how business programs, processes and support tools must be linked to achieve the strategic results. The Design Model helps to sort and simplify the complex issues found in Information Plant change projects. The model provides an illustration of the various Information Plant dimensions and provides guidance as to where issues lie and offers insight into the proper domain for analysis. The Design Model provides the tools for understanding issues and quickly involving the proper resources in effective problem solving.

The Design Model represents the Change Dimensions in an enterprise and allows critical issues to be segmented and rigorously resolved.

Strategy

The Strategy Dimension is used to determine key results that must be achieved in order for the enterprise to succeed in the marketplace. These key results are at the intersection of what the competitive marketplace desires in goods and services and the core competencies of the company to competitively provide those goods and services. Key business results are described with information about the company's current position and the industry's future direction.

Specifically, strategies define the enterprise's Strategic Performance Areas and the current business performance in these areas. It also identifies the enterprise's needed results within each area, as well as the performance gap between current and needed performance. The following are examples of performance areas that are typically addressed in strategies:

Operational Performance

Regulatory Performance

Capital Investment Performance

Financial Performance

Employee Satisfaction

Product or Service Quality

An effective strategy needs to address the following types of issues:

The definition of the Strategic Areas

The performance required in each area as well as the current performance

The data that measures the performance in each area

Program

One of the key insights of the Design Model is the existence of the Program Dimension. Programs are used to translate the objectives in the Strategic Areas to specific features in business processes. Each program will create specific requirements for several processes, thus "tuning" the processes to achieve strategic results. The Program design process includes the business rules needed to ensure the organization can deliver the desired results. Programs are primarily designed to attack and leverage opportunities to improve one aspect of the operation, such as the Quality Assurance Program or the Safety Program. Examples of other programs that are currently implemented in industry include:

Training Program

Supply Chain Management Program

Just In Time Inventory Program

Labor Relation Program

In addition to identifying the specific business policies and rules, the Program Designs identify the specific data required to monitor and interpret the program. The Program Dimension of the Design Model:

Defines the programs utilized by the enterprise

Identifies the business rules required to control each program

Identifies the information flow needed to implement each program

Defines the data required by the business rules

Process

The Process Dimension contains the work or business processes within the enterprise. The business processes are defined by the activities performed and the information required to perform those activities. Examples of business processes include:

Maintenance

Business Planning

Product Development

Sales

Procurement

Material Management

The Processes must be aligned to meet the requirements of the Program Dimension. Processes need to be configured to optimize the efficiency of the work activities while complying with the rules established in the Program Dimension. Compliance with the requirements of the Program Dimension provides the mechanism to achieve the overall objectives.

Process designs produce:

Process Models of the information flow between individual process steps

Logic specifications that describe the particular activities and logic associated with each process step

Identification of the data used and generated by the process steps

The Process Dimension is where work is accomplished and represents the information flow in the process as well as between the other processes. The configuration and design of the Process Dimension defines the basic requirements for organizational structure and other tools needed to implement the process. The features required of application software, as well as how it should present data, is determined by the process design. It also defines the skills required of employees as well as the procedural definition of their work tasks.

To ensure optimal enterprise wide integration each process must operate in context of the other business processes. An efficient enterprise will organize the business processes to collect and synthesize data in such a manner that it delivers the highest value to the entire enterprise. This can only be achieved if the processes are designed with a vision for enterprise-wide integration. The Program Dimension is intended to provide this overall vision for the organization and for the design of the processes.

Tools

The enterprise infrastructure of facilities, software, hardware, procedures and employees is contained in the Tool Dimension. An effective enterprise has the appropriate technical infrastructure required to optimally support the Process Dimension in accordance with the requirements of the Strategy and the Program Dimensions. The Tools dimension includes the following:

Organizations

Facilities

Support Hardware

Software Applications

Technology Platforms

Tools define the physical resources the enterprise uses to execute the business processes. A good technical infrastructure helps an organization execute the business processes consistently throughout the enterprise, enables the effective communication of critical information, and simplifies the effort required to executing particular business processes.

Tools that best meet an enterprise's requirements must be developed with a complete understanding of the enterprise. The tools must enable the strategic results, implement the business rules, and optimize the process execution. These goals need to be achieved in an integrated manner across the enterprise.

Data

The Data Dimension represents the foundation for the model. The data dimension provides guidance in how data is defined and how data sets relate to each other. This dimension contains the logical relationships among the enterprise data elements, as well as their definitions.

Understanding the data is critical for developing an integrated application suite. The data dimension contains the fundamental definition for the enterprise's information. This is where confusion in data naming and interpretation is clarified.

We are still debating the Data Dimension's position in the model. We have placed it as a foundation for the other dimensions. However, we don't see independent data projects very often. When we do, they are directed at unraveling a specific data structure (such as an equipment database) that has strategic implication. The data is dealt with throughout the other dimensions. We have debated whether the data dimension is really at the foundation of the Design Model or distributed throughout the other dimensions.

Project Model

One of the things we have recognized is that the process of changing an enterprise requires a significant commitment of resources and time. This necessitates a series of change projects over an extended period. One of the key issues in managing change is to keep projects small and time to implementation short. MetaPower has developed a six-step life cycle that we use to manage projects. The life cycle has been developed and enhanced during the past several years as we worked with a broad spectrum of clients. This approach to Information Plant change projects supports effective teamwork, solutions development and management involvement.

Task 1 - Reason

For a project to be effective, it must be directly linked to key business results. The team must develop a clear statement of the targeted result(s) to be achieved. This statement must be adopted at the executive level as it will serve as the project guide throughout the project.

Task 2 - Assessment

The assessment step gathers performance and organization information about the current condition of the company. This analysis identifies root problems. These problems present opportunities for improvement that can contribute to the targeted results. The assessment phase builds a common understanding of issues for the team members.

Task 3 - New Ideas

Ideas about how the company could change may be stimulated by research or by benchmarking comparable companies or industries. These ideas are developed in team "new

ideas" sessions where brainstorming activities generate ideas upon ideas for how the key business results could be accomplished. It is important that minimum constraint be placed on the generation of ideas, and that all ideas are acceptable ideas.

Task 4 - Develop Design Model

Based on the current assessment, new ideas and benchmarking data, the team begins to focus on an appropriate operating strategy for achieving the targeted results. Based on these initial ideas, a Design Model is developed. The modeling effort immediately begins to drive out policy issues, cultural issues, and practical implementation issues. As each of these issues are resolved, the project team will be required to make trade-off decisions concerning how the objectives will be achieved.

The final deliverable of this phase is the proposed design. This design includes all of the logical processes and business data required to achieve the targeted results.

The critical requirement of negotiating alignment through the Design Model is typically not a costly task in terms of resources, however it tends to be one of the longest duration tasks in the project plan. It is critical that management thinks through the designs and commit to the changes necessary to fully accept the designs. Until this acceptance is obtained, the project cannot effectively proceed.

Task 5 - Plan Implementation

Once the design is approved, a plan to implement the proposed solution is developed. The plan identifies all tasks and resources required to successfully implement the design. The implementation planning process must negotiate alignment through the Design Model for all of the proposed changes to ensure they are consistent with company standards. The cost of these changes must be identified and rolled up to calculate the cost benefit of implementing the solution.

The implementation plans are then presented to management for their approval and for the funding authorization.

Task 6 - Perform Implementation

Once the project implementation is approved the final project task is to implement the design, monitoring the performance of the various business processes to verify the execution of the design and the realization of the targeted results.

Putting the Models Together

When we take the Design Model and the Project Model together, we start thinking about designing a complete enterprise. We apply the project model to the Strategic Dimension and the design task produces a series of Program Projects that are designed to close performance gaps identified in the Strategy Dimension. The Strategy Implementation Task becomes one of following the life cycle for each of the Program Projects.

When we execute a Program Project, the reason is taken from the Strategy Plan and at least a portion of the new ideas are driven out of the Strategy Design. Once we get into the Program Design, it must stay consistent with the Strategy Design and any inconsistencies or changes must be re-negotiated with the Strategy Dimension.

The Program Plan identifies changes required in processes. These changes must be negotiated with the processes and are implemented through Process Projects. The Programs Implementation task is one of executing a series of Process Projects.

As you can see from the adjacent figure, this pattern repeats itself until you get to the Tools Dimension where the Implementation Task is no longer another design project. It is at this point that physical implementation occurs. When the project has traversed the complete process, the implementation is in compliance with the Strategic Objectives.

It should be noted that "Putting the Models Together" creates the impression of much design work with little implementation. This is where the Messy World comes into play. You have to recognize that just because we can draw a model that shows all this fitting together this way does not mean that we can stand the resource consumption required to execute this way. It does provide us a framework for understanding how to scope a project and identify the corner of the Messy World we want to make a little better.

A word about the Data Dimension is in order. As I noted earlier, the data is dealt with in the other dimensions, so we only occasionally see Data Projects.

MetaPower Design Technology

Due to our time constraints, I won't spend much time on the details of our Design Techniques. By way of introduction, our approach to business designs requires a rigorous methodology to document and control the design information. As noted earlier, we take an engineering approach to designing the Information Plant. We use a variation of the Yourdon Structured Analysis technique. This technique is based on proven information and systems engineering techniques that have been in use since the late 1970's.

The Design Technology uses three basic design documents:

Data Flow Diagram

Logic Specification

Data Dictionary

Data Flow Diagram

Data Flow Diagrams (DFD) are graphical representations, similar to flow charts, which illustrate information or data flow as the link between overall program or business process steps. The DFD is the central design document and is further defined through the Logic Specifications and Data Dictionary documents.

Logic Specifications

Logic specifications are simple structured English statements of the logic that makeup a low-level process depicted on the DFD. The logic specification must register all data that enters the process, all changes, and creation of the data that leaves the process.

Data Dictionary

Finally, the DFD and the Logic Specification are supported by a dictionary that defines the meaning of all the data in the design. The document includes not only the English definitions, but it also describes the detailed sub-data elements that makeup the data flows illustrated on the DFD.

Case Histories

We have two clients that have been working with the methodology for a number of years. Both of these clients have achieved significant success. The following case histories are taken from material produced by our clients with their permission.

TVA's Browns Ferry Nuclear Station

We have been working with TVA's Browns Ferry Nuclear Station since 1995 when we were contracted to help sort out their work processes. This was done as a precursor to implementing a comprehensive work management and document management system. Many of the process designs were developed into functional specifications for the software applications.

Browns Ferry has received several awards for the accomplishments over the last several years. These awards include:

Presidential Award for Excellence

VP National Performance Review - Hammer Awards (2)

Reengineering Industry Association - Giga Excellence Award

The annual savings at Browns Ferry have been estimated at 10's of millions of dollars. However, two areas were tracked in detail.

The overall man hours needed to process a work order was reduced 41% from 39.8 man hours to 23.3 man hours. This number includes man-hours invested in the work order during the initiation, planning and scheduling process.

The other area that was tracked in detail was procedure revisions. As noted in the following figure, procedure-processing time was reduced from 24.6 hours to 10.5 man hours. This covers the time used to administratively process changes to the various procedures used in the plant.

When these two areas are combined, they represent a substantial annual savings.

While these administrative savings are impressive, the real benefits realized at Browns Ferry are associated with the efficient way they operate. Perhaps the most obvious illustration of the improvement is the fact that they are now conducting refueling outages in the 19 day range. Although I am not familiar with Boiling Water Reactors, I understand that this is a record for this type of plant.

Montana Power's Colstrip Station

The Colstrip Station is a four unit 2276 MW mine mouth fossil fuel generating complex located in southeast Montana. The plant is located in a remote area that is environmentally controlled as a pristine area. Consequently the site is designed as a zero discharge water facility and has large wet scrubbers in place to assure clean air compliance.

My colleagues have been working with Colstrip for over 10 year. Much of the MetaPower Methodology was field tested there. In 1995, Colstrip was facing deregulation. They developed a business plan that set aggressive targets to meet the competitive challenge. The business plan specified what was to be accomplished but not how it was to be accomplished.

A Program Design was developed which addressed the how of the business plan. The objective was:

> "To achieve the minimum required production from each plant equipment for the least possible cost."

The program specified all the rules required to meet the objective. While the Colstrip journey has been painful, the program has provided the one stable point of reference thought out the change process and helped keep the change initiative on track.

In the three years following the initial program development, annual Operations and Maintenance costs have been reduced by 40%. In 1999, generation is at a near record-setting pace.

Net generation is up 3.5%

Non-fuel O&M costs are down 38%

This results in $/MWh down 40%

Opacity excesses are down 12%

Recordable accidents are down 57%

Closing

In closing, I would like to leave you with a thought. We all know that "change is inevitable," that fact screams at us from all quarters. What no one seems to say is that "mastering change is inevitable." Those that do master it will win and those that don't will have to find something else to do.

I want to thank you for being a great audience. I have enjoyed visiting with you this morning.