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Role of Industrial Automation in BPR

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Introduction

This paper is based on the assumption that a company has followed a structured methodology that has selected automation as a means of achieving the objective metrics that have been developed. An enabler is a driver that creates a condition under which something can happen and to make possible the desired outcomes. Enablers are necessary to ensure success of an activity or process but are not sufficient in themselves to guarantee it. A process being reengineered should be enabled not driven by these change levers.

Similar Characteristics of Enablers:
provide different ways of doing work
provide for various methods of achieving results
focus on the process
complement each other

Summarizing the work of Davenport and Connor and Lake they are in agreement and focus on three enablers of BPR:

- Technology - what the infrastructure can do;
- Organizational Restructuring - people issues
- Human/Cultural - motivation and a stimulation

This paper will first concentrate on technology and then examine the changes in the organization and supporting culture.

TechnologyTapscott and Caston, Hammer and Champy, Davenport, and Furey et al have in various statements stated the world has moved into an information era where resource focus is shifting from capital to human and information resources. A focus group of BPR practitioners was held that identified "proper understanding of technology enablers" as one of the key factors contributing to the success of a BPR project. This evidence would lead one to believe a BPR project can not be done successfully without Technology playing a significant role, additionally the enabler of BPR should be Information Technology (IT) not just Technology.



However, IT presents a paradox, it is often considered to be part of the problem as well as the answer to the problem. Figure 1. presents a new paradigm in the role of IT. The purpose is no longer to simply gather data and collect this into summaries but is to provide some interpretive context so the knowledge of the corporation is extended. The only reason for doing any of these processes is to aid in the decision making process which in turn effects the data collection. The purpose of BPR is to develop an end to end process starting from the customer and backing through the organization to the beginning of that process. This paper does not deal with what constitutes a process but deals with the enabling effects provided by IT generally and industrial automation specifically. Enabling technologies are those that have a significant impact on a business process. This includes items that support or make possible actions such as:

- changing tasks to be parallel rather than sequential;
- simultaneous use of the same data;
- instantaneous communication and co-ordination of processes around the world;
- capturing, analyzing, and distributing information and other intellectual assets for understanding and decision making; and
- monitoring tasks and activities to eliminate intermediators. The overall enabling nature of IT is to provide facilities that capture data at the source, capture it only once, ensure there is no redundancy, and communicate the data providing everyone with the same information. Read access to information must be pervasive, there must be total sharing of information to support employee empowerment. A virtual extension of the company can also occur allowing work without the limitations of time, geography, and distance. The major impact is the extending of the internals of the company to be part of the customer organization's value chain. Industrial automation and information technology trends are:
- Implementing computer systems that integrate field / plant facilities and corporate information systems to provide fast and cost-effective information transfer. Figure 1 New Decision Paradigm
 - Shift from personal computing to work group tools in support of collaboration, enabling users to streamline a process (e.g. decision support, work group systems).
 - Implementing Wide Area Networks (WAN) and Local Area Network (LAN) technology to implement SCADA host systems and support information sharing.
 - Standardization of inter-corporation data formats (e.g., Electronic Data Interchange (EDI), Internet).
 - Implementing open architecture control and information systems using n-tier client-server.
 - Implementing Relational Database Management System (RDBMS).

- Installing smart transmitters and end devices.
- Adoption of standards.
- The use of WAN and LAN technology has been the most responsible for enabling business to take advantage of other technologies and enable the communications necessary to eliminate barriers from geography. Using an open systems architecture automation strategy provides the following benefits:
 - The ability to transfer investments in software, training, and intellectual property to future upgrades.
 - The independence from a single vendor for future additions and support.
 - The ability to expand, upgrade, or replace old subsystems in cost-effective phases.
 - Distributed functionality resulting in decreased consequences of component failure.
 - Improved system wide functionality and processing performance.
 - Availability of commercial off the shelf (COTS) applications packages.
 - Provides for the integration of the islands of automation. A significant aspect to ensuring the effectiveness of technology is in standardization. The standardizing of hardware and software will reduce training and spare parts costs. As well as standards for hardware and software, a company must develop engineering, programming/configuration, installation, and construction standards to complement the initiatives taken with the automation. Standards will benefit the consistency of the installations and enhance the maintainability of the systems planned to be installed. Some of the rationale given as to why technology implementations in the last few years have produced little in productivity or profitability improvements are as follows:
 - focusing on the frills versus performing the basic functionality
 - concentrating on hardware rather than processes, wanting to have the latest and fastest technology
 - tailoring applications to existing business practices
 - applications primarily for monitoring and control, limit information sharing, or support functional processing, and do not participate directly in the delivery of a process's product or service. The types of data most often collected for industrial automation consists of:
 1. What and how much has been processed, i.e. production
 2. How is the equipment performing, i.e. controlling
 3. What is the health of the equipment, i.e. maintenance monitoring
 Each of these types requires a different set of attributes to be used by a different part of the organization. The key is the source for all to be the same place, the end device. These devices are to be considered a shared corporate asset. Even though they may have been originally implemented to support primarily one area, there is a leverage available to all areas.

Organization and Culture Automation is more than just the installation of hardware and software to gather, process and present data in an electronic format. Automation changes the nature of how these tasks are performed by the people involved. If the full benefit of

corporate automation is to be realized then automation must change how people do their job. Automation must be associated with "retooling" of the staff not just the equipment.

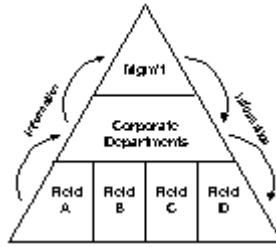


Figure 2 Traditional Information Hierarchy The traditional organization hierarchy is based on knowledge as shown in Figure 2. Knowledge is fed upward and is concentrated at the higher levels of the company thus the higher an individual is in the hierarchy the more knowledge they possess. This is how these traditional management hierarchies are designed to function. Automation allows data to flow freely to all staff which disrupts traditional reporting hierarchies thus the "knowledge" hierarchy is broken. The hierarchy will inevitably shift to an "experience" hierarchy where those who can make the best decisions due to their experience become the leaders as shown in Figure 3. Often Operators are in a position to make those decisions due to their proximity to the process. If the automation system is allowed to provide them with the necessary information to be financially aware, then substantial benefits will result provided Operators are trained and authorized to maximize the profitability of their operation not just the production.

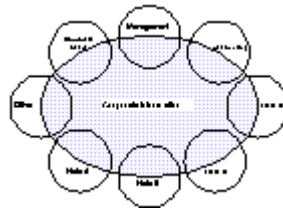


Figure 3 New Experience Based Organization The migration away from a knowledge based hierarchy specifically impacts middle management. Operations data is directly accessible by senior management and senior management can send information directly to Operations staff. This faster and seamless communications require new working procedures otherwise automation is not utilized to its maximum benefit. The decision on new work procedures does not impact what an automation system is but how it is used. The key issues around human resources are as follows:

Culture shock/Resistance to change/Early buy-in

- Staff retraining/Staff reductions/Staff re-deployment
- Perceived loss of control and input
- Training for all staff/Keeping up
- Technical maintenance and support increases
- Implementation for the right reasons
- Obsolescence/upgradability/compatibility/

- dependability/serviceability.

Quantifiable Benefits The benefits to be achieved are many fold and vary somewhat from industry to industry but can be consolidated into a two categories: cost reduction and revenue enhancement.

Cost Reduction	<ul style="list-style-type: none"> - work on an exception basis - elimination of data re-entry, corporate use and reliability of data - combining activities into one - optimization at the lowest level
Revenue Enhancement	<ul style="list-style-type: none"> - increased production - reduced downtime - shorter time to production - new revenue streams

An example of these benefits is the oil and gas industry who have experienced the following quantifiable or hard benefits due to the installation of field automation. For the most part these benefits are not cumulative and will vary with oil or gas operations.

Type of Benefit	Level of Benefit
Increased production	5% to 10%
Reduced downtime	5% to 10%
Reduced workover costs	15% to 25%
Reduced electrical power costs	20% to 25%
Reduced contract manpower costs	10%
Reduced costs	5% to 35%
Reduced vehicle costs	6% to 10%
Reduced driving (windshield) time	30%+

The benefits listed above are derived from a variety of sources that were consolidated in the published volume "Automation Costs and Benefits Reported by Industry". Even

though these are specific to the oil and gas industry the same grouping can be applied to any other industry.

Intangible Benefits The following intangible or soft benefits are more difficult to quantify but their impact can be as large as the hard benefits:

- Increased field personnel productivity
- More accurate and reliable data
- Reduced data handling and paperwork
- Increased operating efficiency
- Real time data for monitoring/analysis/control/ production optimization
- Integrated security/monitoring systems
- Reduced transporter imbalance penalties, maximizing throughput
- Faster reaction to spot market opportunities for commodity base products
- Improved response for acquisition or divestiture
- Faster response to developing problems (alarms/dispatch systems)
- Faster reporting of production volumes for analysis/decisions/marketing
- Increased scope of data capture
- Increased safety/security/environmental performance
- Flexibility to respond to time-of-day electricity pricing
- Reduced accounting time in receivables
- Improved management of cash flow
- Processor of choice for 3rd party or private label processing
- Production loss avoidance

Conclusion

The use of industrial automation with accompanying information technology can and does enable BPR for the radical change of processes in a business. There is no reason from a technological aspect why from process to president's desk can not be a reality. The business must also make conscience changes to the organizational structure and supporting culture. References available upon request from Vernon W. Bachor.