

CREATING THE 21ST CENTURY ORGANIZATION:
THE METAMORPHOSIS OF OTICON

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Abstract

Much has been written about transforming organizations. At the heart of this activity is the notion of Business Process Redesign (BPR), the restructuring of a firm's basic business methods. We describe some of the forces that are behind this need for major organizational change. Next, we provide an overview of BPR and raise several questions concerning its suitability as a theoretical underpinning for radical organizational transformation. We then describe the transformation of Oticon, an international manufacturing firm with headquarters in Denmark. We have called this transformation a *Metamorphosis* because of the complete reconceptualization of the firm that took place. Using the example of Oticon, we speculate about the prerequisites for change of this extent, paying particular attention to the role of technology, which has been enabling rather than driving.

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Introduction

One current fashion in the management of technology is “organizational transformation,” the radical change of an organization from one form to another, often as a result of the infusion of technology (Hammer 1990). In this conceptualization, the transformation takes place by subjecting basic business processes to intense scrutiny. That is, by recognizing those processes that are fundamental to the mission of a firm, reconstituting them in an efficient manner that cuts across functional lines and produces defined business outcomes; and constructing single person, complete jobs, with data gathered once where the work is performed and where parallel activities are linked together rather than integrated (Davenport and Short 1990; Hammer 1990).

The power of technology should be used to:

..radically redesign our business processes in order to achieve dramatic improvements in performance ... not to automate an existing process but to enable a new one (Hammer 1990, p.108).

In this view, technology creates these new organizational arrangements: ones that are flatter, with knowledge at the bottom rather than at the top; ones that consist of self organizing and managed work groups rather than command hierarchies; ones that use technological tools to augment human skills and abilities rather than enhance inequities among workers; and ones that use technology to link workers together so they may share knowledge and coordinate their activities rather than relying upon vertical communication (Drucker 1988). The implication of this approach is that the technology infrastructure is installed first and the organizational arrangements then follow.

But there is much evidence that calls this notion into question. Studies of the impact of technology, for example, Bjørn-Andersen (1986), Turner (1984), and Kraut (1989), have typically shown relatively marginal effects on organizational structure and performance. Similarly, the number of instances where technology has been used successfully as the driving force behind large scale organizational change are few.

Every new generation of hardware and software has brought promises of significant break throughs in organizational performance. Technology vendors have been keen to argue the organizational and strategic importance of their newest creations, and we as Information Technology (IT) and Management Information Systems (MIS) researchers have been equally quick to support a technology imperative.

This paper presents first the pressures that are driving firms to transform their organizations. We then provide a short critique of business process redesign (BPR) and reengineering as a foundation for organizational transformation. Next, the Oticon case, an organization threatened by extinction that reinvented itself, is presented followed by an interpretation of what occurred. We end by summarizing what we have learned from the Oticon example about transforming organizations and the role of technology in that process

External pressures for organizational transformation

Competition has become intense and operating environments are more complex, largely as a result of the ease with which information can be moved within and among organizations². Not only has competition between firms increased but its nature has changed fundamentally. Being a large or low cost producer was often sufficient as a business strategy. Today, such approaches seem inadequate. More important is the ability to innovate and respond quickly to opportunities and changes in the environment, to reduce time to market, to improve customer service, and to enhance quality of products.

Traditionally, firms have been organized into hierarchies based on principles of task specialization and span of control. Such organizations are often referred to as “command and control” because instructions issued at the top flow down through middle management to operatives at the bottom of the organization who execute them. Reports on operations flow in the opposite direction. Although such forms of organization may have unambiguous accountability, they tend not to take advantage of employee skills and abilities, and they lack self regulating mechanisms. They result in organizations which do not have the flexibility and adaptability required by these new business challenges. In order to meet these challenges, organizational theorists have proposed structures that are flatter and leaner, where work is performed by autonomous units augmented with information technology. Such new organization forms are referred to as “knowledge intensive,” “networked,” or “virtual”(Charan 1991; Drucker 1988). These structural innovations are not limited to internal options; they include external arrangements, such as partnerships and alliances.

While these new organizational forms are appealing, there is little practical experience with them. There are relatively few guidelines that can be used by managers to either select the proper target structure; the correct transformation process to get there; the way technology should be arranged; or the way to re-configure management processes, such as supervision, control and compensation in order to support these structures. If, for example, autonomous work units are given sufficient latitude and are innovative enough to make decisions on their own, what technology should be used to support them and how does one insure that coordination takes place and that integration is realized? How should existing coordination and control mechanisms be modified to be consistent with this situation?

In the past, it was assumed that organizational designers had to choose between one extreme or the other, for example, between local autonomy or central control. However, neither of these options are likely to yield success in the turbulent, highly competitive environment being now being faced. Accordingly, we see companies formulating mixed strategies such as “being a global network of independent power centers each with its own growth targets and business strategies,” and wanting to be a corporation that is “characterized by simplicity, transparency and vigor” composed of “power centers where ideas are examined critically in the context of our everyday business”³ and beyond. In short, desiring to be nimble, innovative and enlightened firms. To be a firm that achieves both for a high level of autonomy on the local (divisional) level while maintaining overall

² Due partially to advances in communication and information technology.

³ These quotations were taken from the annual report of a large, international Danish pharmaceutical firm.

coordination and synergy among functional units. Although these goals may be easy to state, they are far more difficult to realize.

A pleasant consequence of the revolution in communications and information technology is that more options are now available for designing work, because technology can be used to augment human skills and abilities, and information and tools can be moved to where work is performed. Workers need no longer to be co-located in either space or time in order to work together. While technology may not cause such an innovative and enlightened firm to emerge, we maintain it has an important enabling role to play in creating one.

A 21st century organization with these characteristics is faced with multiple challenges. How does a firm achieve:

- delegation of authority along with synergy?
- independence of action along with collaboration?
- decentralization of decision making along with managerial control?
- local power centers without excessive duplication?

These issues becomes even harder for a transnational organization, where specialized functions need to be reallocated among business units based upon best practice, availability of labor, and markets. The tension between local, global, and corporate demands must be reconciled for each activity. While innovation in products and processes is desired, these need to be channeled into high payoff avenues. How can uniqueness and synergy be fostered together? When should a unit lead and when should it follow?

While specific solutions can be created for each of these issues, they would be static. What is needed are self adjusting, dynamic mechanisms that change as conditions warrant. Discarding all of the hoopla, is BPR and reengineering a likely process for such a demanding transformation as we have portrayed? And then, what role does technology play in BPR?

Is BPR the answer?

Business process redesign (BPR) or reengineering strives :

to breakaway from the old rules about how we organize and conduct business. It involves recognizing and rejecting some of them and finding imaginative new ways of accomplishing work (Hammer 1990, p.104-105).

This involves identifying the business processes that add value to an organization and result in tangible end products for users, and re conceptualizing them to be efficient whole person jobs that rely extensively on technology for communication, information, action, and coordination. The resulting jobs are cross functional and should be optimized across an organization. Unnecessary processes are discarded in order to realize performance benefits.

BPR has several shortcomings. It is based on principles of “scientific management”⁴; it is top-down, expert led; and it defines in advance a desired outcome (structure). We address each of these characteristics in turn.

The inadequacies of scientific management are well documented. While concentrating on the development of efficient layouts and operational procedures, scientific management neglects the “people” aspects of an organization. That is, it does not consider such factors as culture, power, politics, social structure, and motivation. While scientific management may result in an efficiently designed task, little consideration is given to the individuals who perform the task, how they work with others, and the factors that influence their behavior.

In general, top-down, expert led interventions fail often because they assume that employee behavior can be isolated and changed individually (Beer and others 1990). Supporting this high failure rate, consulting companies in Denmark estimate that BPR succeeds only fifty percent of the time, and Bashein, Markus and Riley (1994) report that consultants publicly state 70% of BPR projects fail. Change needs to start at the periphery of an organization, and ought to be led by small ad hoc groups focused on the work itself (Beer and others 1990). The problem in an organization setting is not to identify constructive changes to make, but rather to select from among the many candidate options for redesign in some consistent manner and to obtain the support of those who will have to make changes in their work.

Successful organization change is a dynamic rather than a static process. Thus, it makes little sense, as prescribed by BPR, to specify end configurations in advance. Ends need to emerge as the result of the change process itself (that is, to be emergent). It may well be that the process, rather than the end configuration, is the stable portion of change.

For these reasons we believe the magnitude of organizational transformation suggested by the demands of the new competitive environment require a change process more encompassing and more based on process than is BPR. We describe the Oticon case to see whether BPR principles or some other change mechanism appears to be operative, and to understand better the role that technology played in this process.

Oticon

One of the most dramatic examples of an organizational transformation where IT has played an important role is the Danish manufacturer of hearing aids, Oticon.

Oticon is one of the five largest producers of hearing aids in the world, with about 1200 employees and annual sales of approximately DKK 480 million (at current exchange rate about \$80 million). Oticon is truly an international firm; it exports more than 90% of its production to over 100 countries through subsidiaries and agents. Oticon has its own basic research department, its own production facilities, and has positioned itself to be the preferred partner for leading hearing aid clinics around the world.

Consistent with this philosophy, Oticon has always stressed the quality of their hearing aids, relying strongly on their engineering and product design. However, towards the end of the 80's customer demand changed from wanting a relatively large, high quality device behind the ear to a more discrete unit inside the ear. This trend was strongly exploited by

⁴ It is even sometimes referred to as “the new industrial engineering” (Davenport and Short 1990).

a US competitor, and Oticon, who was number one in the industry in 1979 and a market leader until the mid 80's, was faced with decreasing market share (especially in the US market). Oticon suffered its first financial loss in 1986.

A new CEO, Lars Kolind, was recruited in 1988, and managed to get the company into the black in 1989 by instituting drastic cost controls. Every single expenditure had to be approved by him personally. However, Kolind realized after a couple of years that all of the benefits of cost cutting had been realized. Only very marginal savings could be achieved from further conventional automation and cost reduction in production, and he turned his attention to a major restructuring of the head office in Denmark.

The real issue was to transform Oticon from an *industrial* organization producing high quality standard hearing aids to a first rank *service* organization with a physical product. The organization Kolind envisioned, one in which the various functional units worked together in a truly integrated manner to craft innovative customer driven products and one that was more responsive to customer demands, could not be achieved by normal structural or procedural change. It was necessary to create a completely new, *innovative, flexible, and learning* organization.

In the process of wrestling with these problems, Kolind explains:

I sat down on New Year's Day in 1990 and tried to think the unthinkable: a vision for the company of tomorrow. It would be a company where jobs were shaped to fit the person instead of the other way around. Each person would be given more functions and a job would emerge by the individual accumulating a portfolio of functions.

Kolind called his new vision a "spaghetti organization" because the multiple roles people were to play were so intertwined.

The headquarter and administrative offices, which previously had been located in two different buildings, were merged into a totally new building, designed especially for the purpose, as part of the organizational transformation.

What did Oticon do?

Four types of organizational changes were initiated⁵ in order to reduce overhead costs, and to create a more flexible and innovative organization:

Elimination of the traditional departments

Instead of organizing the company into traditional departments, the head-office was turned into one large department, and all work was organized as projects in order to highlight their temporary nature. This discourages the departments from attending to their own interests instead of those of the full company. It furthermore discourages managers of the various departments from fighting for power for their own functional areas rather than working in the interests of the total organization. The absence of departments also provides for much more flexibility in responding to unexpected work demands.

⁵ The following discussion pertains to a totally re-structured head office with roughly 130 employees concerned with marketing, accounting, R&D, production management, and servicing of the sales force and their customers. The production facilities, which are located around the world, were not changed as part of this transformation.

Marketing, for example, is an area where work load fluctuates throughout the year. August through November are particularly busy with preparations for exhibitions and trade shows. During the autumn, marketing could easily use 30 people. Now, instead of having a large fixed number of employees working in marketing throughout the year, a much smaller staff permanently work there (around 5) including the (project) head. As the workload increases over summer and early autumn, more people are recruited internally from the other project groups (e.g. from R&D) to staff an expanded and concentrated marketing effort.

Organization of work in form of projects

A project is comprised of a project leader, who is appointed by top management, and a group of workers. It is the job of the project leader to recruit a team to carry out the project. To do this, the project leader advertises the project on an electronic (company) bulletin board, using his/her workstation, and employees sign up for the project using their workstations.

Employees can sign up for whatever projects they fancy, but they are only allowed to leave a project if the project leader agrees, or if they can sell their present task to somebody else (find a replacement). If, for instance, someone identifies a new business opportunity and can obtain top management support (resources) for it, he/she will become the project leader for this opportunity and can start recruiting staff immediately. Within a couple of hours the project can be created, staffed, and work on it can commence. Being able to allocate resources and focus them this quickly greatly improves Oticon's response to unanticipated demands from customers.

Employees occupy several positions

Employees can work on several tasks, often requiring different skills, at the same time and in this way on several projects. This means that they have an opportunity to use their skills in ways that are more satisfying to them than if they had only one job. But, it is also a much more versatile way for organizing work as well as allowing the company to make better use of the diverse set of skills that most employees possess.

The organization of project work permits employees who want to further develop their skills and who are willing to get involved in different projects to do so. As Kolind explains, "there is no room for employees that stick to the old concept of one job, one person."

For instance, it was found that employees in accounting and production could contribute in an innovative way to the creation of marketing material. Hearing aids are a product for the end-consumer. Employees in accounting might have views on products that marketing specialists have not considered. Having workers with different backgrounds and perspectives on a project brings diversity into play in a natural manner.

New control philosophy

Top management in Oticon believes that employees who have chosen to sign up for a particular project will prove to be much more interested their work than if they were assigned to jobs by management. Thus, they will be more responsible for the own work and they will be more motivated to do it effectively. This means that managerial resources are freed up as there is no longer a need for project leaders to act as monitors; workers perform this role themselves and they have proved effective at it. Instead, the demand is now for project leaders to act as *innovators* and *motivators*.

Perquisites for the organizational Metamorphosis in Oticon

The dramatic organizational changes described⁶ above, however, could not have been achieved if it had not been for two distinct change strategies: a new open plan office layout, and elimination of 95% of all paper.

No private desks

Oticon decided to do away with private offices for everyone in the firm, including Kolind. They took down all the walls and created one large open space. All employees have identical desks and chairs located in the open space with only a workstation and a mobile phone/charger on each desk. The principle is that if employees need to work together on a number of projects with different people, it was not practical to have everyone in a fixed location. Accordingly, workers set up where ever they choose and people change physical location often.

Since employees now no longer have a private desk, everybody is left with a small lockable caddie with one drawer for personal things and a couple of shelves for storing up to ten files. Whenever an employee wants to move, he/she can just wheel the caddie to an empty desk where one just sets up. All physical artifacts are in the caddie and access to worker specific information is through the workstation. A major reshuffling of 80 employees in December 1993 was accomplished within two hours.

Elimination of paper

One of Kolind's change strategies was for a "paperless office," where everyone had a workstation⁷ that would permit them to access a common set of office applications and all their own files, independent of where they were seated, physically. As all documents are scanned when they are received and employees are discouraged from keeping paper files, 95% of the paper in the office has been eliminated. Information is stored in electronic form and can be retrieved from any workstation if one has access authority. Once the ID code has been entered, access is provided to central files and a personal calendar along with tools for creating, transmitting, duplicating, and storing documents that may contain text, drawings, and graphics⁸. Oticon decided that rather than accessing all data over the network, it was often easier just to move a worker's central processing unit (CPU) along with the caddie when changing desks (and plug in a local monitor and keyboard).

With all information in electronic form and identical work space for everyone, a person can easily change desks in order to join a new work group. Once when Kolind was out of the office, a group of employees decided that they needed his space and they moved his belongings somewhere else!

⁶ The Oticon story has been told by Peters(1992), by Holtham (1992), by Morsing (1994), by Thygesen-Poulsen (1993), by CNN, by BBC, and it has been the topic of countless newspaper and journal articles in Denmark.

⁷ The workstations are 386 PCs with 8 Mb memory running Windows and LanManager. The key application for scanning of documents is based on HP-AIMS, which is a development tool that uses an Informix database system. This system was developed with Andersen Consulting.

⁸ In late 1993, Oticon acquired Group Systems V, a group decision support system in order to provide meeting support. In this way they hope to improve the collaborative decision making environment within the head office.

What is more important than the reduction in the amount of paper is that the physical layout can be easily rearranged to match any new task structure. For example, if there is a customer complaint from a hearing aid clinic in Atlanta, it is possible to create a new project to handle the complaint within a matter of hours. Everybody receives a brief description of the new project on their workstation, and they can evaluate for themselves whether they have something to contribute to the solution. If they should want to work on solving the problem, they can sign up for the project. A few hours later, a full project group can be established, with desks next to each other, working to solve the customer's problem. In this manner, Oticon is able to bring a full range of resources to bear on a problem much more quickly than can their competitors.

Results obtained so far in Oticon

No formal, independent assessment has been carried out of the organizational transformation at Oticon. Accordingly, we can provide only impressions of the consequences of these changes along with an opinion of their overall affect.

One aspect that was not expected has been the difficulty in classifying incoming documents in such a way that they can be accessed by other than the person who does the classification. Another unexpected occurrence has been the unwillingness of employees to sign up for new tasks beyond the ones they already have. This may be because everyone works harder now than they did before. There seems to be more pressure on individual workers now due to the expectations of their colleagues (social control) than there was with the prior, traditional, managerial control system.

From January 1991 to January 1992 (the transition period) no one in the head office resigned. However, there was a 10-15% layoff, particularly affecting secretaries and administrative support staff. This is partly due to almost everyone now being able to handle their own correspondence and record keeping. Job satisfaction appears to be up too. Oticon is perceived now as a more interesting place to work and tasks are more challenging. Few want to go back to the old way of working.

It is our impression that the results obtained in Oticon so far have been positive. Even though many of the changes are not likely to show up in the bottom line (e.g., market share obtained through new innovative products or better service to clinics) there are indications that Oticon has improved its competitive position. The profits declared for 1992 were nine times better than those of 1989 and 1990 (the company had a loss in 1991) and sales are increasing. More important, however, it has been possible to reduce the time-to-market for new products significantly. The recently introduced Multifocus System model, where the hearing aid adjusts to the level of background noise, was brought to market six months earlier than it would have been possible under the old product development method.

Discussion

We have argued that bringing about massive organizational transformation requires more than rethinking basic business functions as advocated in BPR. Even if key processes involved in delivering a service or product were recognized and streamlined it would not have resulted in the magnitude of performance improvement needed at Oticon. These changes require a complete re-conceptualization of what it is meant to be a business - not just the firm's mission or the content and sequence of tasks workers perform - but a

rethinking of the way people relate to each other, the work they do, how they are led and supervised, the way they are compensated and rewarded, as well as their physical environment. Change of this magnitude has been called “frame-breaking” (Tushman and others 1986). We call this complete re-interpretation of a firm its *Metamorphosis*.

In order to illustrate the extent to which a Metamorphosis goes beyond BPR, we consider five dimensions along which the change in Oticon took place.

Holistic vision

All writers on BPR argue that change has to be driven by a vision. The question is who creates this vision and of what is it? In the early work by Davenport and Short (1990) the business vision was the starting point for the redesign. Later, the vision was reduced to “process visions” (Davenport 1993), that is, they come after identification of business processes to be redesigned.

At Oticon, the vision was different; it was a radical statement of what the company wanted to be. “Be the No. 1 hearing aid company by 1997,” as Lars Kolind formulated it. “One in five in 95” as Jan Carlsson has expressed the SAS vision.

But the vision has to be more than what one desires to be; a goal. It must identify a *consistent set of strategies* for getting there. As part of creating these strategies, all assumptions about a firm need to be questioned and the way business is done rethought. At Oticon, this involved re-conceptualizing the product they were selling (a service with a product attached instead of a mass-manufactured product); redefining their customers (not the hearing aid clinics but the customers of the clinics - the consumer of the hearing aid); a totally new organizational structure (flexible project groups instead of a normal hierarchy); new job structure (multiple rather than single jobs); new reward and incentive structures (less prestructured and more based on informal performance appraisals from all project managers one is working for); new control structures (self control rather than middle management supervision); new office lay-out (open plan instead of individual offices); new technology (the integrated IT office support system); a new firm ownership arrangement (major portion held by workers and management rather than just held privately); and most important, acknowledging that human resources were the firm’s most important asset. The slogan internally at Oticon was, “Think the Unthinkable.”⁹

Focus on employees rather than business processes

It has become common to focus on business processes as a starting point for BPR. Business processes are certainly important, but focusing on them to the exclusion of all other factors that determine worker behavior tends to preserve the status quo rather than to facilitate massive change. And concentrating on redesigning only business processes promotes efficiency at the expense of innovation and flexibility.

Instead of business processes, the focus at Oticon was on enhancing the motivation of each individual employee. The expectation was that if barriers to employee performance were removed (these were mostly viewed in terms of constraints on what employees could and could not do) and workers were provided with advanced productivity enhancement tools along with new skills, they would perform better as individuals, perform in a manner more consistent with the interests of the company, and would have better working life quality too.

⁹ This is also the title of a popular book about Oticon by Thygesen-Poulsen (1993)

Commitment

However, if a massive change along the lines suggested here is to succeed, employees must be strongly committed to it. This commitment needs to be motivated positively rather than negatively (for example, by the fear of losing one's job). In Oticon, employees are given shares in the company each year. As of 1991, employee ownership was at 6% with the intention for it to rise to 25% in the future.

Another factor that created positive commitment to the change was the "fish-bowl" effect. Lars Kolind skillfully used stories in the media about the re-invention of Oticon to create a positive, desirable image for the firm. The (fairy tale) story has been told over and over in the newspapers and media in Denmark and abroad. This means that every employee has been the recipient of positive attention; people are curious to learn more about the firm and what it is like to work there. These positive attitudes associated with the Oticon story have been transferred to workers making it difficult for them to view the firm negatively, or for that matter objectively.

Participative rather than external driven approach

It is often argued that worker participation is good for situations involving gradual change, but not for those with radical change because nobody will be willing to cut their own throat. People are just too self centered to put the interests of the firm before their own. BPR, as we have mentioned, is described as top down and expert led, probably for just this reason.

Contrary to most organizational transformations described in the BPR literature, e.g. (I/S Analyzer 1993), the process followed at Oticon was participative. It was not restricted to a few managers or led by an external consultant. Everyone was informed and involved one way or another in implementing the change and most of it was worked out by the employees themselves. Although the process was driven by the vision of Lars Kolind and his charismatic leadership style was always in view, it was still a very open process.

In the Metamorphosis approach, the emphasis is to such an extent on motivating employees by enhancing the skills and capabilities, that the change process could not be driven by an external entity¹⁰

Culture

A massive change of the type that took place at Oticon requires an egalitarian culture because so much is being asked of workers. The old Oticon was elitist. As an example, there were five classes of company cars depending on a person's managerial level. When Kolind joined the company, he was offered a royal-blue Jaguar XJ Sovereign 6.2, with leather seats and mahogany-panels, which had been driven by the former CEO. He thanked them and said that his old Saab would be good enough. It did not take long before the standard tier of company cars had adjusted itself (Morsing 1994). It is clear that Kolind is keen to have as little distance as possible between the top and bottom of the firm. He might even argue that there is no bottom at all.

Analysis

¹⁰ In Oticon two senior staff were recruited from the outside, one to advise on internal change and the other to lead the design of the integrated IT office system. These two workers are now normal employees.

Can we place the events that took place in Oticon is a somewhat broader perspective. Tushman, Newman and Romanelli (1986) suggest that the need for context frame-breaking organizational change springs from three classes of factors: industry discontinuities, product-life-cycle shifts, and internal company dynamics. Both industry discontinuities and product-life-cycle shifts played a role in Oticon. They go on to note:

Frame-breaking change is driven by shifts in business strategy. As strategy shifts so too must structure, people, and organizational processes (Tushman and others 1986, p. 9).

We might add that technology too is likely to shift. They note that frame-breaking change “is revolutionary change *of* the system as opposed to incremental changes *in* the system.” Six factors are usually involved: reformed mission and core values, altered power and status, reorganization, revised patterns of interaction, and new executives. At Oticon, all six factors played a role, providing good support for Tushman, Newman and Romanelli’s concept of frame-breaking change.

Bashein, Markus and Riley (1994) have proposed a set of preconditions that govern success and failure in business process reengineering. Of the positive preconditions they identify, seven - senior management commitment/sponsorship, empowered and collaborative workers, strategic context of growth/expansion, a shared vision, sound management processes, appropriate people participating full time, and sufficient budget - were present in Oticon. The other factor they identify, realistic expectations, does not appear to have been operative. Oticon charged ahead.

While the Bashein model is consistent with the Oticon experience, we believe that the factors we have identified are important aspects of radical organizational transformation or frame-breaking change.

Role of IT in the Metamorphosis

In BPR, IT is a fundamental part of the rethinking, if not the primary driver. IT was never the starting point of the organizational transformation at Oticon. Kolind had a vague idea of what technology could do, but he formulated his vision without any detailed analysis of IT. There was never an articulated IT strategy that was aligned with the business strategy (Venkatraman 1991).

Oticon had determined that a development engineer spends up to two thirds of his/her time generating and searching for information. If that effort could be reduced by making the process easier, substantial increases in effectiveness could occur. However, Kolind did understand that a well thought out and integrated office system could help achieve his vision of a paperless office with information available where and when it was needed. When Oticon did not have the technical resources to develop the office system, they recruited a leader and formed a strategic alliance with two outside firms to develop it.

While the supervisory structure has changed and workers have more varied jobs, this is mainly due to the change strategy Oticon followed - cross training and self selection of assignments - rather than the undermining of the hierarchy that might result from high connectivity (through the office system). Technology supported the new control structure (self managed) by providing information to workers when and where they need it. Contrary to notions in Computer Supported Cooperative Work (CSCW) literature, where technology is used to overcome barriers of space and time, Oticon preferred to co-locate workers as a means of achieving synergy and integration. Thus, technology was used

mainly to facilitate easy worker movement around the head office and reconfiguration of work groups instead of supporting geographically remote workers.

Technology has also had a rationalizing influence on individual and group behavior. The need to make things explicit along with the direct cause-effect results of actions taken leads workers to become more responsible for their actions and for these being more visible to others. And we believe that technology has contributed to cultural change at Oticon. The more egalitarian climate is supported by equal and easy access to information and by the ease of communication with fellow workers provided by the office system.

Although IT has not been the cause of the radical transformation at Oticon, it certainly has facilitated these changes. The flexibility in physical location and the ability to quickly concentrate resources would be difficult to accomplish without the integrated IT office system.

Conclusion

While technology plays an important role in radical organizational transformation, it is not central to it. Rather, technology is an enabler. Technology allows different organizational *options* to be used that would not be practical without it. Just as reinforced concrete permitted buildings to be designed with previously impractical forms (for example, Saarinen's TWA terminal at JFK airport) so technology allows us to restructure organizations in ways that were not previously possible.

We must always remember it is not technology itself that should be the primary focal point of organizational transformation. What is important is the vision of *how* an organization *can* be transformed. It is the new way to motivate workers; the way that coordination can be accomplished naturally; it is how to bring the right resources to bear on a problem without direct intervention; it is the way a product can be brought to market significantly faster than your competition; and it is the way that local and global needs can be reconciled. Technology is only the hand maiden of these changes.

The Oticon experience provides many clues to bringing about radical organizational change. Oticon was not conceived and then implemented. Oticon was not a one time change followed by business as usual. There was no final destination identified in advance and no chart to guide the passage. Oticon evolved and continues to do so. It is dynamic. Stay tuned

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