Library Automation and Organizational Change

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Catherine Collins

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by Aaron Bales

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The University Libraries of Notre Dame closed their library system, NOTIS, during Christmas break in 1998. In January of 1999, they brought a new library system, Aleph, into production. The NOTIS system is based on a large IBM mainframe with text-based terminals. Library patrons and staff use the same terminal connections to access the catalog. The system is command driven, and all computation activity takes place on the mainframe. Aleph is a client-server system, using an ORACLE database mounted on a UNIX server. The library staff use a Windows client on PCs to access the database. This client uses a graphical interface, with drop-down menus and buttons. Staff edit records on PCs, and send them back to the server when they are finished. The library patrons do not use the same software to access the catalog. Instead, they connect with their web-browsers, using virtually any computer platform they like.

I. Identification of the Issue

The above example is only one instance of the large-scale changes that affect people’s work lives. These types of changes raise many important issues for managers, from the level of director to unit supervisor. Some issues are primarily technological. What equipment will be needed? Is the technological infrastructure in place? Will the system crash when the date changes to January 1, 2000? Other issues are more social. How will the employees react? Will they accept the change or resist it? Can the change process be made easier?

Unfortunately, this second group of issues can be easily overlooked. Managers often do not address human issues adequately, even though they are aware of them, and even though they consider their employees, clients, and other people to be important (Backer). This paper will focus on human aspects of change, particularly in the context of library automation projects.

II. Change Issues in the Public and Private Sectors

While the specific issue of library automation is located principally in the public sector, the processes and challenges of change are common to both areas.
Human Factors in Library Automation

Librarians, staff and patrons must make a number of adjustments as a result of any library automation project, whether it is an original implementation or a migration. One key area is the relationship between people and technology. People have to change the way they behave and think to work effectively in an automated environment. They skim through cards to find a catalog record in a manual system. To find a catalog record in an automated system they use computer commands (Smith). In a migration scenario, this might be a change from typing keyboard commands to choosing buttons or menu items on a graphical interface. For long-term employees, this requires yet a third “mental map.”

These demands for change easily lead to stress reactions of fear or anger, especially when they are large-scale or frequent. Smith mentions several sources for these emotions, such as loss of control, worries about identity and security in the workplace, and breakdowns in interpersonal relationships. It is no wonder that people often resist change. However, Smith cautions against regarding human responses solely as a barrier to change. For leaders who pay attention to social issues, these responses provide valuable feedback and help to implement a more successful system.

Historical Perspective

The early history of library automation can be divided into three phases, the Developmental Phase, the Operational Phase, and the Integrative Phase (Montague).

The development phase was the period of early experimentation up to the early seventies. During this period a small number of institutions engaged in automation projects. While management hoped that systems could be transferred from one institution to another, this was not the case with these early efforts. Libraries did not have similar computer operating systems, they did not have standardized procedures, and they could not agree on outputs. However, the development of the MARC record was a significant development that allowed libraries to communicate bibliographic records in a standard format.

The operational phase, in the mid-to-late seventies, saw the expansion of automation in a wider variety of libraries. Vendor-supplied systems, shared computer resources, and networking made this possible. Since libraries were no longer forced to develop their own systems from scratch, it was an
easier and less expensive task. During this phase most library automation projects still focused on
discrete tasks, such as check-in or circulation. Operational areas were not integrated, and the overall
workflow stayed basically the same, “it has been utterly possible to use the automated system as
inefficiently and ineffectively and with as little knowledge of what is going on as with the manual
system” (Montague).

Montague proposed that the next phase would be an integrative phase, in which the automation
systems would cut across operational lines, actually change the way libraries do business, and improve
service.

There were a number of obstacles during these stages of library automation:

- Lack of direction and oversight from library managers to systems staff
- Lack of technical training for library managers
- Failure to develop long-range plans (including a cost analysis of the manual systems and the
  automated replacements)
- Lack of up and down communication between managers and staff
- Lack of staff input
- Lack of staff training
- Lack of feedback mechanisms

Overall, it appears that the several problems, training, oversight, input, feedback, all involved a general
lack of communication.

Migration: Second Generation Systems

Since many libraries, including Notre Dame, have or plan to migrate to second generation library
systems, it is important to consider whether the obstacles are the same.

One view (representing a system vendor) is that they are not the same. Migrations are said to be
easier than initial implementations. Although there may be some staff apprehensions, staff morale is
reported to improve. A significant advantage is that second-time buyers have a better understanding of
what they want in a system, and focus more on quality and customer support, instead of low bids. There
is one potential source of resistance, which is never present in an initial automation project, that is a
hostile “soon-to-be former vendor.” Another important distinction is whether the library is migrating
after successful implementation of a system which simply no longer meets their needs, or whether the library is desperately seeking a new system after a failed effort (Sybrowsky).

The reaction of librarians to this viewpoint is to be mixed. Some libraries have reported a very similar degree of “technostress” during migration projects, with similar emotional responses (stress, fear and anxiety). Staff are required to change procedures, and in many cases the new procedures are not clear-cut —of course, the procedures in the “old” system were not clear-cut in the beginning either (Saunders).

On the other hand, the majority of directors in a survey of 33 libraries that had undergone system migrations felt that “promoting” the system change to the staff was unnecessary. This seems to be primarily due to staff frustration with the old systems, providing a clear motivation for change. The worse the original system, the less staff resistance there was to migration. However, there were still some symptoms of technostress. Many found the vendors training programs to be inadequate, consisting of “canned” presentations were did not apply to local needs. Due to “rush jobs,” the staff at many libraries did not have adequate time to become familiar with the new system before it was made available to the public. In one particularly egregious case, the staff and patrons were given access to the system at the same time. The staff “hated this.” A two-month lead-time between staff and public access gave optimum results (Hallmark).

Private Sector Experiences

While library automation, per se, is not a major issue in the for-profit world, automation in general definitely is. As such, experiences in the private sector provide helpful comparisons.

One very familiar theme from corporate settings in the need to consult with users prior to any sort of migration or automation project. This is true even with systems that are not central to the users’ jobs. Gaudin relates several stories of companies that tried to implement new systems without consulting users. One case involved replacing a mainframe email system with a desktop system. After the company spent $3 million, the employees rejected it because it was not fast or stable enough. In another case, FedEx introduced a scheduling system (which had been very popular with employees at other airlines) without
consulting their own employees. This became one of the issues in a potential strike against the company. One manager pointed out the importance of remembering that “users might like their old systems” (Gaudin). This is an important lesson for library managers to remember in a migration, especially when the original system was basically successful. Even a failed system may have features the employees liked.

Another illustration is provided by Norman’s study of a failed automation effort. An attempt to introduce the CASE (computer-aided software engineering) system in a management information firm provides valuable lessons for both sectors. The goal of the CASE project was to establish a 2-1 ratio of CASE workstation usage among the MIS staff and achieve a 10 to 15% increase in productivity. The project is considered to be a failure, because people are not using it. The company has lost business to competitors who do use the system (Norman).

Norman identifies a number of factors in the CASE implementation, which contributed to its failure. From the beginning, the decision to implement CASE was made by a small high-level committee, without involving staff. There was a successful pilot project, following which the company attempted to expand the system. Their main methodology was a staff-training program. Management assumed that if they provided training, the programmers would use the system. While the training was described as “adequate,” it was informational only, and there was no effort made to change attitudes.

The most critical barrier identified in the study was the high learning curve for using CASE. Management did not make any effort to reduce this learning curve. Instead, each work group that attempted to use the system had to learn it on their own. There was no sharing of tricks or shortcuts, or any help given by those who had already started using the product to new users. Interdepartmental friction and a rigid chain-of-command that stifled communication between units prevented this type of cooperation.

A related factor was the lack of any visible benefits or rewards for using CASE. Instead rewards were based on completing projects under-time and under-budget. Since CASE is intended to increase productivity, it might seem that this would reward its use. But “this means that the rewards are indirect
and totally dependent upon the successful use of the tool” (Norman, emphasis added). In conjunction with the high learning curve, this becomes a negative incentive – the system is likely to slow production in the short-term, until the learning curve is past. If the programmer fails to learn it quickly, rewards are lost rather than gained.

III. Theories and Strategies for Change

In discussing theories of organizational change, many theorists divide changes into different types. Before delving too deeply into specific strategies for change, I would like to examine the relationship between library automation projects and descriptive theories.

Continuity

In the Age of Unreason, Handy tells us that “Change is not what it used to be” (Handy, p. 6). He distinguishes continuous and discontinuous change. Continuous change is gradual and predictable, with one situation leading into the next. This is relatively comfortable for most people. But he asserts that the changes in the workplace now (and in life in general) are discontinuous. That is, changes are abrupt and unpredictable, and hence, far less comfortable.

Handy frequently links discontinuous change to technology. As such, it is easy to reach the conclusion that a library automation project is a discontinuous change. People who worked with paper switch to online systems, and their jobs are altered or even eliminated.

But we should not be too quick to classify it this way. Particularly in the early automation projects, automated tasks were substituted for manual tasks on a one-to-one basis. Because of this, there was no drastic change in the overall workflow; even when specific tasks were drastically altered (Montague). It could be argued that automation has had a more significant impact since that time, as library systems have become integrated.

Calm and Turbulent Waters

Robbins focuses on the frequency of change. He uses two metaphors, “calm waters” and “white-water rapids.” In the calm-waters scenario, change is the exception. Most of the time is spent in a state of
equilibrium, until some crisis (the storm) forces a change. After the change is past, the organization regains a new (albeit different) state of equilibrium. In the white-water scenario, change is continuous, though in a different sense than Handy uses the word. There is no state of equilibrium; instead one period of change is followed directly by another (Robbins, p. 255-7).

It is very tempting to identify library automation projects with the “calm water” metaphor. In fact, Saunders uses a very similar model in her article on library system migration. First various forces bring about a need for change, which requires unfreezing process. This is followed by a period of instability (the actual time of the change). When this is over, the library establishes a new state of equilibrium, as new patterns and procedures are frozen into place.

Because automation efforts are not made frequently, this model appears to be a good match. In an original automation project, the library has been using a manual system as long as it has been in existence. Once the project has been completed, the library will continue to use the new system indefinitely. Even in a migration project, the library may have been using its old system for many years, and certainly would hope the new system would be long-lived.

One potential problem with this model is that it ignores the wider picture of overall changes. At the same time as a library is contemplating an integrated library system, the staff may be dealing with new (and ever-changing) online indexes, electronic journals, email systems, computer operating systems, and even (in Notre Dame’s case) a building renovation. Taken in this larger context, the white water metaphor seems more appropriate to the library environment. It is often not just the project at hand that causes problems for staff and users, but the “unrelenting demand” of changes in many areas (Smith).

Another issue (which was not mentioned in any of the articles reviewed for this paper) is the continuing change following the implementation of an automated system due to new releases and upgrades to the system. Even after a new system is fully implemented, it may not be as “calm” as the old manual system.

One significant problem with the white-water model as a model for change is that it suggests a reactive style of management with unplanned changes. But most library automation and migration
projects are planned, as are many (not all) of the other changes affecting the library staff. This model seems most apt for dealing with the external changes impacting an organization.

The Four Motors of Change

Van de Ven and Poole give a more fully fleshed taxonomy of change. They identify two crosscutting distinctions, the level and the mode of change. The level of change is whether the change involves single or multiple entities (an entity being anything from an individual to an institution). The mode of change is either prescribed or emergent. A priori changes are planned, predictable or follow set rules or patterns (what Handy would describe as continuous). Emergent change is discontinuous and unpredictable. This combination yields four “motors of change.”

1. Life-cycle (single entity, prescribed)
2. Teleological (single entity, emergent)
3. Dialectical (multiple entities, emergent)
4. Evolutionary (multiple entities, prescribed)

While these motors can be separated in theory, most real-life changes involve interaction between them (Van de Ven).

The four motors model provides a more complete description of organizational change, and avoids oversimplification problems. If we examine library automation projects in this context of the four motors of change that Van de Ven describes, we will find rather complex interactions.

The teleological theory, which is characterized by planning and goal setting, provides the closest description of the first stage in an automation project. Libraries may have a variety of motivations for undertaking an automation or migration project. In the case of migration, this might include negative factors, like dissatisfaction with the current vendor, as well as positive ones, like a desire to expand capabilities (Hallmark). These motivations provide the Aristotelian final cause for the project. Most libraries engage in goal setting activities, such as compiling lists of desired features (Begg).

This stage may be described as teleological in Van de Ven’s scheme because it primarily involves one entity (the library) and the process is emergent. At the beginning of this stage, it is not clear where it will finish. Although the process is planned (rather than reactive) the goals are identified during the
process, and may provide a dramatic break (or discontinuity) with the existing manual or automated system. The dialectical motor may be present to a lessor extent, as different stakeholders (such as work units) interact with each other, and occasionally present conflicting goals.

This teleological description fits most, but not all migration projects. For 79% of cases in a migration survey, the projects were planned. But in some cases, the libraries did not have time to develop plans due to legal or financial problems. In those cases, the teleological motor would only apply in a trivial sense, if at all. Those cases are obviously not ideal scenarios (Hallmark).

Towards the end of the selection process, the library must compare its goals and desires to the actual systems available. At this point, the process could be described as dialectical, involving the library and the vendors who would like to supply the system. Vendors and librarians both regard this process as different for migration projects compared to first-time automation efforts. In a first-time automation, libraries tend to rely on numerical evaluation of vendors’ proposals and claims. In migration projects, libraries find site visits to be the most effective way to evaluate quality and hands-on work issues (Begg, Sybrowski).

At some point either during the final selection process or shortly after a vendor is chosen, the process shifts to a life-cycle model. The life-cycle motor is also primarily concerned with the library as a single entity. At this point, the plan, which was developed in earlier stages, becomes the guide for the process. The library engages in a series of steps that were laid out in the plan, possibly on a strict time-schedule. This includes all of the steps technically necessary to implement the system (e.g., data mapping and test conversions) as well as steps to prepare the users. This process is imminent in, or prescribed by the plan, and is much more predictable than the earlier stages. The library may have even planned for contingencies.

Once the actual conversion is done, and the new system is live, the process become somewhat less predictable. Procedures that worked on paper or in test may fail under the pressure of real-life use. While none of the motors seem to be completely dominant at this point, the evolutionary theory is closest. Procedures that work “survive” while others are discarded. The changes may still be described as
imminent, however, because they are constrained by the system. The others motors continue to play some role, as plans are made and carried out, and different stakeholders disagree on various issues.

The dialectical motor may become dominant from time-to-time as the vendor announces new releases, or the library recommends enhancements for the system. At these times the possibilities for change are less constrained, and the results become more emergent.

**Strategies**

The authors who describe actual automation projects also list key lessons and make recommendations. There are a number of general, and some very specific, suggestions along with a couple of common threads. One of the common threads is communication. Whether it is between management and employees, between systems and users, or between the employees at large, it seems that more communication is always better.

A related thread is the need to involve the users in the process as early as possible. Several of the authors suggested that users should be involved at the very beginning, during the selection process. Montage, Norman, Gaudin, Hallmark and Smith all cite lack of user involvement in the selection or planning stage as an obstacle to successful implementation.

Since these two threads stand out, we may conclude that if any overall strategy is too be effective, it must include a high level of communication and user participation.

**Strategies from the CASE implementation**

Norman described three change strategies in his evaluation of the CASE implementation. These strategies could be used independently or in conjunction with each other.

**Rational-empirical**

This strategy focuses on training (i.e., how to use the system) and information (the benefits of the system). It is presumed that teaching people to use the system and providing a rational explanation of why it is better will lead them to use it.

This strategy could easily be applied to a library automation or migration project, as many of the authors indicated the importance of training programs.
Normative-educational

This strategy focuses on group strategies for promoting acceptance of the new systems and providing motivation to use it. First, identify the attitudes that create resistance, and then develop programs to change them. This is similar to developing training sessions in the rational-empirical strategy. The difference is that the sessions are intended to develop positive attitudes instead imparting information.

Power-coercive

In this strategy individuals are induced to use the new system by the threat of losing their job or other benefits (e.g. promotion opportunities). This can be a fairly direct approach to implement change, but it also runs a high risk creating bad feelings, job dissatisfaction, and tension between management and employees. Threats, whether explicit or implicit, will also add to the fear and anxiety already identified as an obstacle to change.

A variation of this strategy can be applied in a positive way by offering employees incentives for change. While this is can be regarded as a power-exercise (the employees who do not use the new system will not get the new benefits) it is less confrontational.

In the CASE implementation, the main strategy that was applied was the rational-empirical strategy. The normative-educational strategy was largely ignored, and the power-coercive strategy was inconsistently applied. Management made statements that employees were required to use the system, but did not follow-up when it was not used. Management also did not provide any direct positive incentives.

This strategy may also be applied to library systems in the sense that when the old (manual or automated) system is shut-off, employees will not be able to perform their duties without using the new system.

Phased Implementation

Saunders recommends a strategy of phased implementation. The idea of this strategy is to minimize the impact of the new system has on staff by introducing modules in a gradual fashion. For
example, a library might implement cataloging or acquisitions functions first, and circulation latter (Saunders, p. 75-79)

This strategy has some advantages. Successful implementation of one module should increase staff willingness to use another. Also, management can deal with the staff in smaller groups, concentrating on the area currently being automated, instead of dealing with all areas at once.

The chief drawback of this strategy is found when the current system is already well integrated. In this case, phased implementation may mean that user’s (staff and patrons) are initially presented with a system that has fewer features than their previous system (Begg, p. 111). There may also be technical difficulties that preclude phased implementation, as the two systems are not likely to communicate with each other well, if at all.

Where it is usable, this strategy should also be combined with other strategies. Saunders specifically emphasizes the importance of training and communication issues.

**Participant Oriented Change**

Zeffane advocates the strategy of participant oriented change, which is based on the premise that change works best when comes from the bottom up rather than from the top down. One reason for this premise is that if the employees introduce change, then they will not have an authority figure to rebel against. It is also based on the idea that collegial affiliation is a positive motivation for change. That is, employees will be more motivated to help with a changes initiated by someone at, or close to, their level.

To use participant oriented change, management needs to shift the responsibility for change away from themselves and towards the employees. This strategy goes beyond considering the users’ needs, or soliciting input, to actually delegating authority to the participants.

This strategy takes advantage of the fact that the employees who are closest to the hands-on work have the most detailed knowledge about it. This also frees the upper management from concentrating on this level of detail, and to concentrate on overall strategic planning.

This strategy may not be effective in all types of organizations. There are some essential elements for participative strategies to work. First, the employees given responsibilities for change must
be well informed. Second, the employees must understand and agree with the mission of the organization. Unless these requirements are met, management cannot expect that the decisions will be beneficial to the organization. The third requirement is that this style of change must be supported by the organization culture. The management must be comfortable with this type of delegation (Zeffane).

IV. Management Functions

The traditional roles of management are planning, organization, coordination and control. These can be applied to these change strategies.

Rational-empirical

The rational-empirical strategy is primarily concerned with dispensing information, presuming that the plans for change have already been made. It involves the organizing function of management, in the sense that the managers determine what information needs to be given to which employees in order to implement the changes. It also involves the control function, in that the management is seeking to influence behavior through the information it dispenses (or withholds).

Normative-educational

The normative-education strategy is concerned with influencing attitudes and behavior. As such, it involves the control function of management, but in an indirect manner. That is, rather than controlling behavior directly, the management attempts to instill attitudes which are likely to result in the desired behavior. Like the rational-empirical strategy, it also involves the coordinating function, as managers decide who should be involved in which programs.

Power-coercive

The power-coercive strategy concerns the management role of control in a straightforward fashion. It is mainly concerned with seeing to it that the change decisions (which have already been made) are carried out as directed. To ensure this, it dispenses rewards or penalties to individuals or groups depending or whether they have implemented the changes. In the extreme, employees who fail to change are fired.
Phased Implementation

Phased implementation involves both the planning and coordinating functions to a large degree. Planning includes determining the order in which to implement the modules and setting timetables for each phase. Coordination includes meshing together the efforts of different groups associated with each phase, and ensuring that each module is integrated with the previous ones when it is brought into production. As more modules are brought into the “live” mode, coordination becomes essential in order to see that the different areas function smoothly.

Participant Oriented Change

Participant oriented change involves the coordinating function of management. Since much of the planning and decision making is delegated downward to the staff, management must integrate these plans and decisions. This is particularly important when implementing an integrated library system (either in an initial automation, or in comparison to a less integrated system), as the activities of staff in one area will have more impact on other areas than they are accustomed to.

The actual delegation of these responsibilities to employees involves the organizing function. Determining how and to whom these responsibilities are delegated is in important part of the change process. This may involve organizing employees into self-managed teams, work groups, or interdepartmental task forces. How these groups are organized, the amount of authority they have, and how they will interact with each other are crucial decisions.

V. Conclusions and Recommendations

The participant oriented change strategy provides the best overall approach to managing library automation and migration projects. Of the strategies which have been outlined, it offers the highest degree of employee communication and participation. These are the same areas that caused the most problems if they were inadequate.

One of the chief advantages of this strategy is that it involves the users of the system at the earliest possible stage of the project. That is during the teleological process of identifying reasons for the
project and setting goals or criteria for a new system. Involving the employees at this stage reduces the need for normative attitude-adjusting sessions latter in the process. This is not to say that managers who adopt this strategy can just ignore employee attitudes later on. Change will still be stressful, and people may still resist it at various points. But, management will not have to invest as much effort in convincing staff that the new system is better if the staff were involved in selecting it.

The rational-empirical strategies of employee training programs will still have a role to play, as the process moves on. As was demonstrated in the failed attempt at implementing the CASE system, this strategy is not sufficient by itself. But users must learn how a new system works if they are to use it at all. Within the overall context of participant oriented strategy, other employees provide much of that training. With their hands-on experience, employee led training can be more effective than vendor-supplied “canned presentations” (Hallmark). This also promotes an atmosphere in which employees will be comfortable sharing their learning experiences, tricks and shortcuts following implementation (Norman).

The other two strategies, phased implementation and power-coercive can not be recommended across the board. The power-coercive strategy is divisive, and is likely make the change harder instead of easier. This strategy aggravates fears about job security, which is one of the sources of change anxiety. While a degree of control needs to be maintained, a threatening approach is not desirable as a general strategy.

The strategy of phased implementation will be helpful for some situations, but not for all. For libraries currently using manual systems or automated systems that are not integrated, this method may help to ease the transition. For libraries that already have a well-integrated system, it could create even more chaos. Within the context of participant oriented change, the choice of whether to include it rests with the employees who actually work with the system.
Bibliography


