

# INFORMATION SYSTEMS AND POWER: STRUCTURAL VERSUS PERSONAL VIEWS

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## ABSTRACT

Power issues impact information systems design, development, and implementation. Our understanding of the sources of power affects how we interpret its potential impacts. This study examines the foundations of both personal and structural power sources. The outcomes of two well-known IS case studies are re-interpreted using the two perspectives. This study shows that IS researchers should employ a structural view of power when exploring its impact on IS design and implementation.

## INTRODUCTION

Many authors have discussed the influence of power in information systems design and implementation (see, for example, Keen 1981, Markus 1983, Markus and Robey 1984, Newman and Rosenberg 1985, Bjorn-Andersen et al. 1986, Kling and Iacono 1984). Much of the research in the area focuses on the balance of power between the user and the information systems (IS) staff, and how that balance affects the interplay between the two groups. Other studies consider how the power structure implied or imposed by a system design affects the implementation process and system use. These studies suggest that incongruence between the organization's existing power structure and the structure arising from the system design often leads to user resistance or system failure.

Research investigating how changes in power structure influence system implementation success often focuses on the viewpoint of individuals. Personal sources of power,

those unique to an individual worker, are analyzed. However, consideration should also be given to structural sources of power, i.e. sources related to position or role within an organization. A structural view of power leads to a better understanding of the collective resistance of groups involved in implementation.

This paper explores the relationship between power and information systems from both the structural and personal perspectives. The paper begins by addressing the concept of power and the sources of power. That discussion is followed by a review of IS research focusing on power issues in system development. The discussion then uses both personal and structural perspectives of power to re-interpret the results of two IS case studies (Markus 1983, Zuboff 1984). The paper concludes by emphasizing the value of using a structural analysis of power to understand IS design and implementation issues.

## POWER AS A CONCEPT

Classical definitions of power includes those of Dahl (1957) and Emerson (1962). Dahl saw power in terms of influence, saying "A has power over B to the extent that he can get B to do something that B would not otherwise do." Emerson wrote "the power of actor A over actor B is the amount of resistance on the part of B which can be potentially overcome by A." Similarly, Pfeffer (1981) later defined it as

"the capability of one actor to overcome resistance in achieving a desired object or results . . . force sufficient to change the probability of B's behavior from what it would have been in the absence of the application of the force."

Mintzberg (1983) looked at the concept in organizational terms, saying power was "the capability to effect (or affect) organizational outcomes."

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Each of these definitions includes the notion of effecting change, but with subtle differences. For instance, effecting organizational outcomes is a subset of influencing people; thus, Mintzberg's power is subsumed in Dahl's. Emerson and Pfeffer both depict power as the ability to change or influence. Emerson, however, described amount of power in terms of the resistance of the person being influenced, while Pfeffer defined it in terms of the force of the person exercising influence. Using Emerson's definition, the person being influenced must be aware of the exercise of power. According to Pfeffer's definition of power, awareness of another's influence is not needed.

One can also distinguish between potential and enacted power (Provan 1980). Some researchers acknowledge potential power, where having the potential to exercise influence is an adequate indication of power. For other researchers, it is not enough to possess power -- it must be enacted. That is, power isn't power unless and until it is used. Consistent with Pfeffer and Mintzberg, this paper acknowledges that potential power is power: it need not be wielded to be threatening or have an effect.

People generally understand what having or using power implies and often use the terms "power" and "influence" interchangeably. As Mintzberg (1983) noted, "the problem with the word 'power' in English is that it lacks a convenient verb form. We are forced to talk of 'influencing' or 'controlling' instead" when the intent is to talk about exercising power.

An intuitive understanding of power does not simplify the task of developing operational definitions. Researchers continue to investigate the concept in different ways. For example, power can result from personal or structural sources. Personal sources of power are the result of the unique position and character of a particular individual (French and Raven 1959). Structural power accrues from one's position within the organization and applies to groups, as well as individuals (Pfeffer 1981). While analyzing power in terms of personal sources is a psychological perspective, using structural sources represents the sociological perspective. In this paper, both views are considered.

### SOURCES OF POWER

The threat that a new IS design will alter relationships within an organization often results in user resistance (Markus 1983, Newman and Rosenberg 1985), making redistribution of power an important issue in IS research. To study the relationship between design or implementation and power structures, the potential sources of power must first be understood.

### Personal Power

As noted earlier, power may be viewed as personal or structural. The choice between the two corresponds closely to one's view of the possible sources of power. The source of personal power can be directly attributed to a specific person. Structural power derives from the organization and one's position in it.

**Table 1: Sources of Personal Power**  
(Adapted from French and Raven 1959, Raven 1965)

#### Personal Power

- |               |                |
|---------------|----------------|
| 1. Reward     | 4. Referent    |
| 2. Coercive   | 5. Expert      |
| 3. Legitimate | 6. Information |

French and Raven (1959) and Raven (1965) cited six different bases of personal power: reward, coercive, legitimate, referent, expert, and information. Reward power is based on one person's ability to reward another. Its strength increases with the magnitude of a potential reward. Coercive power is based on the ability of one person to punish another, increasing with the magnitude of potential punishment. Legitimate power (authority) stems from internalized values in which one person is believed to have a right to influence someone else. Referent power is often characterized as charismatic power. It accrues from an individual's desire to identify with or belong to a particular referent person or group. Expert power accrues from special knowledge that is high valued; its strength increases with the extent of knowledge and another's perception of that extent. Finally, information power is based on a person's access to data or facts. Greater access to information means greater power.

### Structural Power

Power in the structural sense reflects properties of the organization as a social system. Pfeffer (1981) stated that power was "a structural phenomenon created by the division of labor and departmentation that characterize the specific organization or set of organizations being investigated." The individual's power thus derives from characteristics of the organization.

Hickson et al. (1971) and Hinings et al. (1974) postulated and tested a strategic contingencies theory, a structural

## POWER IN IS RESEARCH

approach to power. They said that power in an organization arose from three sources: (1) the ability of a subunit to cope with uncertainty, (2) the degree to which the subunit was central to the organization's workflow, and (3) the substitutability of the subunit's talents. In a test of the theory, Hinings et al. found significant correlations between indicators of power and the three theoretical variables of uncertainty, centrality, and substitutability.

Pfeffer and Salancik (1978) argued that units that are the best at providing resources that are both critical and difficult to obtain will have power within an organization. In an earlier study (Salancik and Pfeffer 1974), they found that the amount of grant and contract money received by a university department was a significant predictor of that department's power. Thus, Pfeffer (1981) subsequently identified three more structural sources of power: (1) the ability to provide resources, (2) the ability to affect decision processes, and (3) the power of consensus.

**Table 2: Sources of Structural Power**

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### Structural Power

1. Coping with Uncertainty
  2. Centrality in Workflow
  3. Substitutability
  4. Provide Resources
  5. Affect Decision Process
  6. Consensus
- 

The ability to affect decision processes is best viewed in terms of control of the decision agenda, since a final decision depends heavily on the alternatives presented (Pfeffer 1981). Likewise, control over the definition of decision premises and the information given about alternatives can be sources of power. This ability to affect decision processes may be the direct result of one's position in an organization, a structural source of power. Pfeffer (1981) described the power of consensus as a subunit sharing a common value or perspective in approaching a situation. Where members of a subunit share a common view, they can approach the situation in concert, giving the group another structural source of power.

Finally, some forms of personal power may be linked to structural sources. A person's ability to use legitimate, reward or coercive power is related to the division of labor in an organization. Furthermore, control over information (Pettigrew 1972) could be associated with the individual's place in the organization and centralization to the communication network.

Several well-known IS studies have sought to understand the interplay between analysts and users in the systems development process. Markus and Robey (1984), for example, noted the need to imply rationality in analysis and design, even though the process is often a struggle to protect personal power. User participation is one rational approach to systems development which appears in much of the IS research with a political theme.

Newman and Rosenberg (1985) concluded that analysis and design was a political process, but that systems analysts tended to be rationally oriented. The clash between the rational analysts and political users led to resistance and contributed to IS failure. Lucas (1984) studied the power position of IS professionals relative to the user community. Contrary to expectations, he found that the IS group was not powerful relative to other departments. These results would suggest that the IS group had little power over the user community in the analysis and design process. Saunders and Scammell (1986) later confirmed Lucas's findings.

Saunders and Scammell's and Lucas's studies relied on perceptions from department staff to determine the amount of power each group possessed. Markus and Bjorn-Andersen (1987) stated that IS professionals may exercise power unobtrusively: "In fact, the very lack of users' awareness of the use of power may indicate an especially effective (i.e. powerful) exercise of it." The greatest problem with user resistance occurred when the user group felt power being exercised and the IS designer was unaware of it. In such cases, the user may believe that the designer is intentionally manipulating the process. To combat that manipulation, the user resists the designer's suggestions and, ultimately, the information system.

Kling and Iacono (1984) analyzed the way in which organizations implemented enhancements to existing information systems. Their analysis showed that the process of maintaining and enhancing an information system was highly political. In some cases, individuals built structural barriers to ensure that their views of the system's development were supported.

Baronas and Louis (1988) found that users' perception of their own power was increased by giving them control during the implementation phase. Increasing the users' power increased the likelihood of implementation success.

These studies help us understand negotiation during the system development and maintenance process. But the political struggle between the IS and user communities during development is only one part of the power

distribution conflict. Another power conflict is evident in the result of the development process, the physical design of the information system. An IS design implies a structure or pattern of information distribution which may not match the distribution among users prior to implementation. Only a few researchers have explicitly investigated the changes in the distribution of power implied by such system designs.

Bjorn-Andersen et al. (1986) studied the effect of information systems on leadership. They suggested that IS implementation complemented or enhanced existing management style more often than changing it. That is, after IS implementation, participative managers were more participative, while non-participative managers were less participative. This suggests a subtle change in the balance of power between managers and subordinates. Markus and Robey (1984) suggested that systems analysis techniques are biased toward retaining the status quo. This would support the assertion that the resulting design reinforces existing patterns, rather than changing them. Bjorn-Andersen et al.'s results (also discussed in Bjorn-Andersen and Pederson 1980) indicated that organizational features of the system, such as user structure, computer role, and information quality, were useful predictors of power change. They further suggested that an information system alters individual users' dependency relationships, bases of power, and ability to absorb uncertainty.

Markus and Pfeffer (1983) and Markus (1983) found that an IS design that matched the organizational power structure was more successfully implemented than one that required changes in the organizational power structure. This implies that each IS design team should be aware of the intricacies of the power structure existing in the organization.

Joshi (1989) developed an instrument to measure user perception of fairness in dealing with the information systems environment. Among the items were measures of the user's perception of relative power within the organization in terms of access to data and conflict among users. The instrument assessed users' feelings about the IS environment (as opposed to feelings specific to a particular information system). As such, it was a move toward measuring the distribution of power among users.

## **ANALYZING SHIFTS FROM TWO PERSPECTIVES**

The IS literature provides many examples of shifts in the distribution of personal power resulting from a mismatch between the design of system and the power distribution of an organization. Two well-known cases are analyzed, first from a personal power view and then from a structural one.

### Personal Power

Zuboff's (1984) description of the automation of a pulp mill is a graphic account of shifts in each of the personal sources of power. There, the traditional mill work system was replaced by a computerized interface to control manufacturing. Prior to system implementation, workers physically checked and controlled the manufacturing process on the shop floor. After implementation, workers monitored it from computers in a centralized booth. Management, as well as the mill workers, had access to the process information contained in the computer.

Introducing the computer system shifted power from the mill worker to the manager, the supervisor and in some cases the technology. The supervisor gained power over the worker because the computer recorded the operator's every move. The increased base of information, stored in the computer for access by the supervisor, led to tighter control and the potential for more reward and coercive power. After automation, the computer controlled operations previously performed by the operator. Losing physical contact with the machine reduced the operator's expert power. The manual skill was transformed into a thinking skill: an operator who could not adjust lost expert power. Legitimate and referent power were challenged by the manager's ability to understand the computerized operations and control the worker's tasks. The manager's effort to retain power was captured in the use of closed-loop systems designed to work without operator interference. Clearly, the system affected several aspects of personal power.

Markus's (1983) study of the design and implementation of a financial information system (FIS) also illustrates shifts in personal sources of power. The system was designed to provide financial reporting for corporate accounting as well as provide profit and loss statements for each of the divisions within the company. Prior to system installation, each division produced its own financial statements and sent them to corporate accounting. After installation, division accountants input data directly to FIS. FIS produced summary statements sent to both corporate and divisional accounting groups.

When production of the financial statements shifted from divisional to corporate control, the division accountant experienced a loss of several sources of personal power. First, the division accountant's knowledge was no longer needed to produce the financial statements, so s/he lost expert power to the FIS system. Second, the division accounting manager experienced a personal loss of legitimate power. Statements were produced under the

**Table 3: Summary of Power Distribution Effects**

Personal Sources	Zuboff (1984)	Markus (1983)
Reward	Manager +	Corporate Accountant +
Coercive	Manager +	Corporate Accountant +
Legitimate	Manager +	Corporate Accountant +
	Worker -	Division Accountant -
Referent	Manager *	Division Accountant *
	Worker *	
Expert	Worker -	Division Accountant -
Information	Manager +	Corporate Accountant +
		Division Accountant -
Structural Sources	Zuboff (1984)	Markus (1983)
Coping with Uncertainty	Management +	Corporate +
	Workers -	
Centrality in Workflow	Management +	Corporate +
	Workers -	Division -
Substitutability	Workers -	Division -
Providing Resources	Management +	Corporate +
	Workers -	Division -
Affect Decision Process	Management +	Corporate +
Consensus	Workers *	Division *

NOTE: + indicates an increase in the power source  
 - indicates a decrease in the power source  
 \* indicates that the power source was threatened

control of the corporate accounting manager and sent to the division manager, rather than division staff producing, verifying and sending final statements to the corporate staff. Third, a corporate accountant could get a statement of division performance at any time. Division staff could be called to explain problems with the statements that corporate retrieved, increasing corporate reward and coercive power over division accounts and managers. Finally, the corporate accountant's information power was increased at the expense of the division accountant. S/he could no longer adjust for special circumstances before forwarding summaries to the corporate accountant, since both received statements at the same time. Here again, there were several personal power explanations for individual resistance to the system.

Structural Power

Keen (1981) stated "Data are not merely an intellectual commodity but a political resource, whose redistribution through new information system affects the interests of particular groups." The same two studies can also be interpreted from a structural rather than personal perspective of power.

Zuboff's (1984) study illustrates shifts in several structural sources of power. A shift in power as a result of changes in substitutability was evident. Being irreplaceable was no longer a source of power for the mill operators, since most of their knowledge was embedded in a computer system that would run without them. Dependency and responsibility shifted from the operator to the technology,

bringing with it a change in the unit's ability to cope with uncertainty. Management controlled the mill operators decision processes by limiting the amount of information workers were given. "We have not given the operators the skills they need to exercise this kind of judgment (to run the computer system) because we don't trust them" (Zuboff 1984). Since information was a resource, the control over this process also represented a shift in resource provision.

Markus's (1983) study also demonstrates dramatic shifts in structural sources of power. The FIS system design affected several sources of structural power. First, FIS challenged structural authority within the company. Prior to FIS, divisions had a dotted line relationship with corporate accounting; results were summarized and forwarded to corporate. With FIS, detailed information was input directly to the system controlled by corporate. The dotted line relationship changed to a formal reporting relationship (although this was not acknowledged at the time of implementation). Second, corporate's access to detailed data disrupted the divisions' centrality in the company information flow. Account data which had previously flowed from the division to corporate accounting now flowed in the other direction. Corporate had equal access to division results, in terms of both timing and level of detail. Third, corporate's access to division data increased their ability to cope with uncertainty. Having more detailed information in a timely manner gave them the ability to react quickly in times of uncertainty. Finally, the project team which determined requirements for the FIS design was composed entirely of individuals from corporate accounting. By excluding division accountants from the design team, the corporate accountants controlled the decision process. With complete control over the design decision process, it is not surprising that the system which was implemented favored corporate accounting.

## **STRUCTURAL VIEW OF POWER IN IS RESEARCH**

Both the Markus and Zuboff studies illustrate how the design of an IS can influence the distribution of power in an organization, as summarized in Table 3. Though the cases were interpreted from both structural and personal perspectives, the most functional view of power to use in IS design and implementation research is structural. Three arguments support this position.

First, the underlying intent (whether undertaken for rational or political motives) of an information system is to support operations, management, or decision making in organizations (Davis and Olson, 1985). Resistance to changes in power distribution pose the greatest threat when multiple individuals or groups are involved with a system. Markus and Robey (1988) emphasized choosing an

appropriate level of analysis when conducting research. A personal view of power helps explain the behavior of an individual within an organization. The structural view of power provides an understanding of groups within an organization or the organization as a whole. The analysis of power involving any information system that crosses departmental boundaries will require an organization level of analysis and a structural view of power.

Second, personal sources of power can frequently be described in structural terms. For instance, Zuboff (1984) stated that workers had less power after automation because their actions were recorded and stored for access by the supervisor. Recording actions led to tighter control. Zuboff interpreted this as management's increased reward and coercive power over the worker. An alternative interpretation would be that automation reduced the workers' centrality in the workflow and control over information -- thereby reducing their power as a subunit. The second interpretation uses a structural view of power to explain the collective resistance of a group of workers. So the ultimate source of many forms of personal power may be structurally determined.

Third, research evidence from IS case and field studies indicate that power problems often result from the structural changes in the organization implied by the IS design (Markus 1983, Zuboff 1984). The FIS design implied a structural change in the organization (a dotted line relationship formalized by the technology). This shifted power to the corporate accounting group. The mill control interface dramatically reinforced the structural reporting relationship between the mill worker and manager, shifting power away from mill workers. In both cases, changes in the distribution of power resulted from changes in the organization structure abetted by the IS design.

## **CONCLUSION**

Previous research into the relationship between IS and the distribution of power in an organization has concentrated on relations between the IS staff and the user organization. It also looked at macro power issues that may not directly apply to a specific IS. Though these issues are important it is essential that future research also investigate the issues surrounding shifts in power distribution among users. The cases we analyzed can be explained by shifts in personal or structural sources of power. In each case, shifts in personal sources of power result from shifts in structural sources of power; the personal shifts can be explained by the changes in the structural power distribution. Researchers should begin by examining structural power for clues to group actions and reactions.

IS researchers should develop methods to assess both the distribution of structural power prior to implementation and that implied by the system design. Systems analysts should be trained to understand structural power implications and to use those power assessment methods which researchers develop. Understanding how a system design will affect structural sources of power in an organization is vital. Does the design disrupt any group's centrality to the workflow? Does it change the information flow or reporting relationships in the organization? Does the design impair a group's ability to cope with uncertainty or provide critical resources to the company? Systems designers make explicit decisions which may reinforce or upset the distribution of user power. If they do not understand the fit between the distribution of power and IS designs, then implementation success may elude them in spite of a carefully managed development process.

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