DO INFORMATION TECHNOLOGY UNITS HAVE MORE POWER THAN OTHER UNITS IN ACADEMIC LIBRARIES?

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Systems Offices that deal with library information technologies have played an important role in academic libraries. However, not much is known about how Systems Offices are positioned within academic libraries. This study examined the present status and the influence of Systems Offices by exploring the power differences among five principal functional units based on Strategic Contingencies Theory. A mail questionnaire was sent to the principal functional unit heads of each of 95 university libraries belonging to the Association of Research Libraries in the U.S. A total of 484 questionnaires were sent and 235 questionnaires were returned. The major findings of this study were: Systems Offices had more perceived power than all but Public Services. Systems Offices had higher levels on contingency variables than most of the other units. Finally, criticality was a factor affecting perceived power between Systems Offices and most of the other units. The study findings imply that Strategic Contingencies Theory may be partially applicable to library settings. Library staff or units may strategically increase their power by aligning their services with goals critical to their library and cooperating with other staff or other units.

Introduction

Information technologies have had a tremendous effect both on individual librarians' tasks and on library organizations. In particular, Web technology enables libraries to provide users with more resources online, almost allowing the realization of a digital library. As a result, the emphasis of library services has greatly shifted from the physical acquisition of information resources to access and user training.

In conjunction with this shift, a strong emphasis has been placed on technical capabilities as a key component of digital libraries (Bishop & Star, 1996; Borgman, 1999). Waters (1998) has also noted that digital libraries exclusively rely upon computer and systems-engineering skills. Consequently, computer knowledge and skills have become increasingly important in librarianship, and information technology personnel have played an increasingly important role in libraries. This trend is clearly reflected in library job descriptions (Lynch & Smith, 2001), in new hiring patterns, and in job categories. In particular, Wilder's (2002) report showed that there has been considerable growth in the hiring of functional specialists "who are media specialists or who are experts in management fields such as personnel, fiscal matters, systems, preservation, etc."(Association of Research Libraries, 2000) in member libraries of the Association of Research Libraries (ARL), demonstrating that there was a 196% increase in the hiring of functional specialists from 1985 to 2000. Moreover, a recent ARL survey showed that about 38.3% of the functional specialists were information technology specialists (Association of Research Libraries, 2005).

However, few studies exist on information technology personnel or Systems Offices that deal with library information technologies. In particular, it is not known how

Systems Offices are positioned within libraries as new work units, or whether information technology personnel and Systems Offices have more power than other units within library organizations. Instead, the existing literature mainly centers on definitions, tasks and responsibilities of the job titles associated with Systems Offices (Foote, 1997; Gordon, 2003; Lavagnino, 1997; Muir, 1995), or, at most, some mention about the information technology personnel regarding their privileged line of communications and different pay structure (Rubin, 2004). This study attempts to understand the status and influence of Systems Offices within academic library organizations by exploring the power differences among units.

Understanding the power within organizations helps to explain organizational decisions or behaviors by showing who gets what, when, and how within organizations (Morgan, 1996). Furthermore, the acquisition of power by a new group rather than established groups may change organizations in many ways. Finally, power may function positively as the social energy that facilitates organizational change or promotes organizational performance (Lawrence, Mauws, & Dyck, 2005; McClelland & Burnham, 2003).

The present study is prompted by the acknowledgement that power affects a variety of organizational decisions or behaviors. This study mainly focuses on whether there are power differences among units, and if Strategic Contingencies Theory is applicable to library settings in understanding the power differences among units.

Literature Review

Conceptualization of Power

Within organizations, people seem to sense what power is and who has it. However, defining power is not as clear as perceiving power. The lack of clarity of the concept of power may be attributed to the potential nature of the concept of power (Aldag & Kuzuhara, 2005; French & Raven, 1959; Lukes, 2005). According to Lukes (2005), power is a potentiality and may be never exercised. Moreover, power is often perceived as a troublesome concept because of its negative connotations (Pfeffer, 1981). These factors all seem to contribute to the difficulty in studying power in organizations.

In order to conceptualize power, the author first examines four perspectives and their definitions, and defines the concept of power for this study. Second, the author discusses the measures of the concept of power in this study.

Perspectives of Power. In the first perspective, power is seen as control. It is defined as the ability to get things done regardless of others' willingness, or as a determination of others' behaviors (Dahl, 1957; Emerson, 1962; Hickson, Hinings, Lee, Schneck, & Pennings, 1971), or as the capacity to change others' states by administering resources (Keltner, Gruenfeld, & Anderson, 2000). These definitions are widely used, particularly in the early literature, and focus on "power over" others (Hollander & Offermann, 1990). The basic assumption of these definitions is the zero-sum of power, or win-lose politics (Baum, 1989).

In the second perspective, power is seen as cooperative. It is defined as the energy to guarantee strategic actions (Hardy, 1996) or the ability to cooperate with others to achieve something desired (Baum, 1989). These definitions stress empowerment, and focus on "power to" do something. This type of power stresses the positive sum of

power, or win-win politics (Baum, 1989). This type of power can be obtained through power sharing.

In the third perspective, power is seen as influence. It is defined as the ability to influence others' behaviors (Aldag & Kuzuhara, 2005; Burkhardt & Brass, 1990; French & Raven, 1959; Kenny & Wilson, 1984; Krackhardt, 1990; Lachman, 1989; Pfeffer, 1992; Scott, 1998; Walumbwa, 1999). Among those who share this perspective, some tend to use the terms power and influence interchangeably or treat influence as a form of power (Galbraith, 1986; Lawrence, Mauws, & Dyck, 2005; Lenski, 1986; Russell, 1986). This group views influence as a subtle form of power through persuasion and education. Here, the people submitting are not aware of their submission (Hardy & Clegg, 1996). In this sense, those who produce effects on others still have the characteristics of "power over" others without involving direct coercion. Others distinguish between power and influence (Aldag & Kuzuhara, 2005; French & Raven, 1959; Lukes, 2005; Munduate & Bennebroek Gravenhorst, 2003). According to French and Raven (1959), power is the potential ability to influence others, whereas influence is "kinetic power" used to change others' attitude, behaviors or values. Influence, then, may be used either to control others or to cooperate with them. In turn, this perspective of power as influence may be positioned between the perspective of power as control and that of power as cooperation.

The final critical perspective sees power as a structural and cultural phenomenon rather than a relational phenomenon (Coleman & Voronov, 2003). According to this view, power is embedded within a pre-defined organizational structure and culture. The perspective of power as influence shares this view to some extent under the circumstance in which people are not aware of the unconscious acceptance of their submission.

The author employed the first three perspectives of power for this study. The first three perspectives view power very differently; however, the definitions of power from all three perspectives convey the characteristics of the "ability or capacity to do something" of being an agent to or with others. This leads the author to define power as the capacity to achieve something desired. By defining power in this way, the concept of power is not limited to either "power over" or "power to." Instead, power functions in both ways.

Measures of Power of the Study. Since the concept of power is abstract, measures of power are not easily obtainable and the validity of such measures tends to be disputed. The author divides the measures present in the existing literature into two approaches: subjective and objective. Subjective approaches attempt to measure power through perceptions such as perceived power or influence (Burkhardt & Brass, 1990; Crawford, 1997; Harpaz & Meshoulam, 1997; Hinings, Hickson, Pennings, & Schneck, 1974; Krackhardt, 1990; Lachman, 1989; Lucas, 1984; Pfeffer, 1992; Pfeffer & Moore, 1980; Saunders & Scamell, 1982; Saunders & Scamell, 1986; Saunders, 1990). Objective approaches, on the other hand, measure power in a variety of ways, including position, participation and representation (Crawford, 1997; Hinings, Hickson, Pennings, & Schneck, 1974; Lachman, 1989; Pfeffer & Moore, 1980; Saunders & Scamell, 1982; Saunders & Scamell, 1986; Saunders, 1990; Welborne & Trevor, 2000), or monetary resources (Crawford, 1997; Hackman, 1985; Pfeffer, 1981; Pfeffer & Moore, 1980).

The objective measures are arguable, since these do not directly measure power itself, but measure it indirectly through presumed sources, consequences of power or both. Moreover, the distinction between the sources of power or the consequences of

power is not clear-cut, thus making the study of the nature and bases of power difficult. Regarding arguable measures of power, Pfeffer (1992) suggests that the most effective way is to use an index of multiple indicators that converge on the concept of power. This study used both subjective and objective measures. Power that was measured through an objective approach was called "observable power" in this study (see Appendix A).

Strategic Contingencies Theory and Criticality

Strategic Contingencies Theory proposed by Hickson et al., (1971) is the main theoretical framework of this study. It explains the structural sources of intra-organizational power by contingency variables, and sees organizations as interdepartmental systems within which the division of labor is the major source of power.

The core of the theory is that contingency variables, such as *coping with uncertainty, substitutability, centrality, and control of strategic contingencies*, are important in explaining the power differences among units. *Coping with uncertainty* is defined as the ability to deal with the environmental uncertainties facing an organization by taking the appropriate actions. *Substitutability* refers to the availability of alternatives to a unit or for personnel of a unit. *Centrality* is defined as the extent to which the activities of a unit are linked to those of other units. Finally, the three contingency variables affect power through *control of strategic contingencies*. According to the theory, power is essentially explained by these contingency variables.

Most empirical studies generally supported this theory (Crawford, 1997; Hinings, Hickson, Pennings, & Schneck, 1974; Lachman, 1989; Saunders & Scamell, 1982; Saunders & Scamell, 1986; Saunders, 1990), although some argue that the concept of

control of strategic contingencies is not clear. Some researchers argue that the construct of "criticality" is omitted or ambiguously defined in the theory (Lucas, 1984; Saunders 1990), separating it from the concept of centrality. Empirical studies also suggest that "criticality," defined as the importance of the tasks of a unit with respect to organizational goals, is an important factor which affects power or resource allocation (Crawford, 1997; Hackman, 1985; Saunders, 1990). Resource Dependence Theory (Pfeffer & Salancik, 1978) also suggests "criticality" as a key factor affecting power. These suggestions lead the study to consider "criticality" in a variation of Strategic Contingencies Theory.

The Key Components of a Modified Model and Research Hypotheses

The key variables of the modified model include: coping with uncertainty, substitutability, centrality, criticality, and power (Figure1). Research hypotheses were drawn based on Strategic Contingencies Theory and stated along with a notation of H.

Dependent Variable: Power. Systems Offices would have more power than other units (H1).

Independent Variables: Coping with Uncertainty, Substitutability, Centrality and Criticality. The library environment has been increasingly uncertain due to rapidly changing technologies. As a result, Systems Offices that deal with such technologies are expected to better cope with uncertainties than other units (H2.1).

Tasks that involve information technologies require highly technical expertise and skills. As a result, Systems Offices are less likely to be replaceable by other units (H2.2). The level of substitutability may also differ according to the dependence on a campus' technology office. The more libraries are dependent upon campus technology offices, the

more the Systems Offices are replaceable. Accordingly, the less libraries are dependent upon the campus technology offices, the greater the increase in the power of the Systems Offices (H2.2.1).

Information technologies are pervasive in library organizations. As such, the tasks of Systems Offices are highly connected with those of other units. A termination of information systems would seriously affect library services. As a result, it is expected that centrality of Systems Offices is higher than that of other units (H 2.3).

As library organizations begin to operate digital libraries, the tasks of Systems Offices have become critical with respect to library organizational goals. As a result, it is expected that criticality of Systems Offices is higher than that of other units (H2.4).

Relationships between Independent and Dependent Variables. The better a unit copes with uncertainty, the more power the unit has (H3.1); The higher the substitutability, the less power the unit has (H3.2); The higher the centrality, the more power the unit has (H3.3); and, the higher the criticality, the more power the unit has (H3.4).

Methodology

Population, Sampling and the Questionnaire

The theoretical population of the study consists of ARL university member libraries in the United States. As of August 2003, the total number of the university member libraries was 100, of which five university libraries were excluded from the study due to the difficulty of identifying units and unit heads. The target population of the study was 95 university member libraries of the ARL. The sample of the study was the entire target population.

The major data collection method was a mail questionnaire method. The questionnaire of the study was built on the questionnaire and interview questions developed by Hinings et al. (1974). However, since their questionnaire was used with business firms, a considerable number of items needed to be changed for the current study. For this, exploratory interviews with eight members of the library management group at a local university library were conducted in the fall of 2002, and meeting minutes were additionally used. The initial questionnaire was pre-tested with local university library staff and was revised based on those results.

For the respondents of the questionnaire, principal unit heads were chosen. Principal unit heads refer to those who have ultimate responsibilities for each of the five functional units: Public Services, Technical Services, Collection Development, Systems Offices and Human Resources. A brief description of each of the units is presented below. For identifying appropriate respondents, two sampling frames were used: the ARL directory and the library staff directories of each of the 95 university libraries. Reference questions via email were additionally used if it was necessary to clarify unit heads. The respondents were to answer most of the questions with regard to other units as well as their own (See Appendix B).

A total of 484 self-administrated questionnaires were sent in September 2003 and 235 questionnaires were returned, which was a 48.5% response rate. A total of 232 questionnaires were usable. Among the 95 university libraries, 88 university libraries (92.6%) participated in the study. Paired t-test, independent t-test, and regression analysis were the main statistical techniques used for testing hypotheses.

Five Functional Units[1]

A library organization is divided by several work units based on types of work done. Although functional units are not uniform across the sample libraries, typical functional units of a library include Collection Development, Human Resources, Public Services, Systems Offices and Technical Services.

The Collection Development unit typically includes departments which are responsible for selecting, evaluating and/or preserving collections and resources. Representative departments include: collection development department and/or area studies. Subject specialists or bibliographers are typically in charge of building collections of particular subjects in large research libraries such as ARL member libraries.

The Human Resources unit includes departments which deal with personnel and/or financial services. Some libraries have both financial and personnel offices in a support services unit, while other libraries have two separate units. The Human Resources unit does not provide library users with direct services, but is a necessary unit which enables a library organization to function properly with respect to personnel matters.

Public Services refer to those functions that directly involve the user community. The Public Services unit is subdivided into, but is not limited to, departments such as reference, user education, circulation, interlibrary loan services and document delivery services. The Public Services unit includes branch libraries which specialize in particular subjects such as mathematics, music, business, etc. at some university libraries. However,

[1] The description of a general structure of each of the five units is based on organization charts and other information available on the population library web pages.

these branch libraries may function as separate units in other university libraries. For instance, medical and law libraries are often independent units in many ARL member libraries.

Systems Offices refer to departments which are responsible for library technologies including selecting, implementing and repairing various hardware, software, and networks. Currently, an agreed-upon term for such departments does not exist. The term, "Systems Office" or "Library Systems Department" seems to be one of the most widely used terms (Muir & Lim, 2002). According to Lim (2004), about 46.3 % of the participating Systems Offices of university libraries in her study were established in 1990s or 2000s, demonstrating that the Systems Offices unit is the youngest functional unit in academic libraries.

Technical Services refer to those functions that involve receiving and preparing materials for use, and are not generally seen by the public. Cataloging and acquisition are good examples of technical services. A technical services unit includes such departments as acquisitions, cataloging, serials and/or preservation. The Technical Services unit is one of the oldest functional units.

Units of Observation and Unit of Analysis

The five functional units were examined through principal functional unit heads. In other words, units of observation and units of analysis were distinguished in the study. Unit of observation of the study were individual unit heads, while units of analysis were functional units.

Data Screening Procedures for Hypothesis Testing

Since most of the questionnaire items were developed for this study, it was necessary to screen the items through checking the reliability and validity of the items. Reliability tests using Cronbach's alpha, correlation analyses and factor analyses were the statistical techniques used in order to address these issues. Only the items that survived the tests were used for hypotheses tests (See Appendix A).

The dependent variable, power, was measured in three different ways. Each set of the measures of power was named as "perceived power," "perceived influence" and "observable power." Initially, it was intended to generate a composite score of the three different measures of power, but as a result of factor analyses, it was decided to analyze them separately. Only perceived power and perceived influence were used for regression analyses due to the considerable discrepancy of the sample size and different ways of obtaining data points among the measurements. The respondents were to answer the questions measuring perceived power and influence with regard to other units as well as their own, whereas, they were to answer the questions measuring observable power about their own unit or themselves only (See Appendix B).

For the hypothesis tests, the data which were aggregated at the library organizational level were used because the respondents from different units within a library were to rate the same unit and their rating should be dependent. The three sets of the hypotheses (H1, H2 and H3) above were tested under specified multiple hypotheses. A two-tailed test under $\alpha = .05$ was preformed to test all of the hypotheses since there was no previous study on power of Systems Offices in academic libraries.

Findings

Descriptive Statistics of Units

Among 88 participating university libraries, 58 libraries (65.9%) were public, 28 libraries (31.8%) were private, and 2 libraries (2.3%) were both public and private. The number and percentage of respondents and their representing units were: Collection Development (CD, N=22, 9.5%), Human Resources (HR, N=44, 19%), Public Services (PS, N=38, 16.4%), Systems Offices (SYS, N=45, 19.4%), Technical Services (TS, N=40, 17.2%), and Joint Functions (N=43, 18.5%).

The category of the Joint Functions refers to a unit that consisted of two or more functions. Two common combinations were that of Collection Development and Technical Services, and that of Collection Development and Public Services, 16 (37.2%) and 8 (18.6%) of the Joint Functions respectively, followed by the combination of Systems Offices and Technical Services consisted of 4 (9.3%). The frequency of occurrences of other combinations ranged from 1 to 3. In detail, the number and percentages of these combinations of the Joint Functions were: Public Services and Technical Services (3, 7.0%); Collection Development, Public Services and Technical Services (3, 7.0%); Human Resources and Systems Offices (2, 4.7%); Public Services, Systems Offices and Technical Services (2, 4.7%); Collection Development, Systems Offices and Technical Services (1, 2.3%); and Collection Development, Public Services, Systems Offices and Technical Services (1, 2.3%).

A head of Joint Functions of the study fell into four categories. The first category was that a head equally represented two functional services. For example, one respondent of Joint Functions of Systems Offices and Technical Services was the principal unit head of both Systems Offices and Technical Services units. In this case, the title of such a principal head showed both functions (e.g., associate director for Technology and

Technical Services). In this category, two separate departments were organized under one head and each of the department heads reported to the head. The second category was that a unit performed two functions without separate departments, or with a vague distinction between such functions. For instance, in the study, 7 respondents of the combination of Collection Development and Technical Services and one respondent of that of Systems Offices and Technical Services fell into this category. In the third category, two functional unit heads were hierarchically positioned. For instance, four Systems Offices unit heads of the study were positioned under higher ranked Technical Services or Human Resources unit heads. The final category was that the second highest ranked manager directly below the library director represented three or four functional units. This category was similar to the first category in terms of structure, but different regarding the range of responsibilities of the manager. The unit heads of this category oversaw multiple functional units. Seven respondents of the Joint Functions fell into the last category, among which some respondents might fall into this category due to vacancy of a unit head(s) whose responsibilities were taken over by another unit head.

Finally, for hypothesis testing with respect to observable power, the Joint Functions were analyzed under the five units by merging a joint function into an appropriate unit based on t-test.

Results of Hypothesis Testing

The hypothesis H1 was tested under a set of hypotheses because it was decided to analyze three different measures of power: perceived power, perceived influence, and observable power. Paired t-tests were performed to test for perceived power and

perceived influence, while ANOVA and post-hoc t-tests using Bonferroni procedure were performed for observable power.

The results of a set of H1 tests showed that Systems Offices (SYS) had more perceived power and perceived influence than Collection Development (CD), Human Resources (HR) and Technical Services (TS), supporting the hypotheses for the pairs of Systems Offices and each of these units. However, there was no statistical difference in both perceived power and perceived influence between Systems Offices and Public Services. Public Services were perceived as equally powerful and influential as Systems Offices (Table 1 and Table 2).

On the other hand, Public Services had more observable power than Systems Offices, while there were no statistical differences in observable power between Systems Offices and the other units (Table 3), indicating that the hypotheses with respect to observable power were not supported. That is, when power was measured by observable indicators such as: the number of committee membership of which the library director is a member, the number of weekly conferences between the head and the director, the number of consultations that the director has with the unit head, the number of new hires, and the salary of the head, Systems Offices did not have more power than other units. On the contrary, Public Services had more observable power than Systems Offices. This means that the results of hypotheses on subjective power (perceived power or perceived influence) and on objective power (observable power) were contradictory. The possible reasons for this contradiction are described in the section of discussion.

The results of a set of H2 (H2.1 to H2.4) tests showed that Systems Offices had higher levels on coping with uncertainty and criticality than other units, and a lower level

on substitutability than other units, supporting the hypotheses H2.1, H2.2. and H2.4. On the other hand, Systems Offices also had a higher level of centrality than other units except for Public Services. There was no statistical difference of centrality between Systems Offices and Public Services (Table 4), indicating that the hypothesis H2.3 was not supported for the pair of Systems Offices and Public Services units. In other words, as expected, Systems Offices had a higher ability to deal with environmental and operational variations, were less replaceable, and had more critical tasks regarding the library's goals than other units. With respect to centrality measured by the degrees of length and severity of disruption of unit's services that would affect library users, Public Services were ranked as high as Systems Offices.

On the other hand, the results of the hypothesis H2.2.1 showed that there was no relationship between the dependency of Systems Offices on the campus technology offices and the perceived or observable power of Systems Offices. However, the less dependent on campus technology offices libraries were, the greater the influence of Systems Offices on a variety of tasks in libraries (β= -.362, $p<.013$) (Table 5).

A set of H3 (H3.1 to H3.4) were further tested under two sets of hypotheses. One set of hypotheses tested the relationships between the contingency variables and power *within* each of the five units, while the other set of hypotheses tested the relationships *between* Systems Offices and other units. The *within* hypothesis tests were used to find out whether each of the contingency variables was a good predictor of power *within* each of the units regardless of organizations. B*etween* hypothesis tests were used to find out whether each of the contingency variables was a good predictor of power differences

between Systems Offices and other units across the organizations. A regression analysis on perceived power and perceived influence was separately performed.

The results were: first, with respect to perceived power, criticality was a positive factor affecting perceived power *within* most of the units: Human Resources (β= .329, p<.008), Pubic Services (β= .347, p<.004), and Systems Offices (β= .382, p<.003). Coping with uncertainty was a positive factor affecting perceived power in only Collection Development (β= .324, p<.006), while substitutability was negatively related to perceived power in only Technical Services (β= .241, p<.036) (Table 6). Here, the items for substitutability were reversely computed. As a result, the higher the score, the less substitutable. Centrality was not related to perceived power *within* any of the five units. In short, the higher criticality, the more power *within* most of the units, while the less substitutability, the more power *within* only Technical Services. However, centrality was not a factor explaining the power differences *within* any of the units. Second, with respect to perceived influence, criticality was positively related to influence *within* all of the five units, while other contingency variables (coping with uncertainty, substitutability and centrality) were not significant *within* any of the five units.

The results of hypotheses regarding the relationships *between* Systems Offices and other units were: First, with respect to perceived power, criticality was positively related to differences of perceived power *between* Systems Offices and Collection Development (β= .250, p<.048), Human Resources (β= .304, p<.013) and Public Services (β= .379, p<.002). However, criticality was not statistically related to perceived power differences between Systems Offices and Technical Services. This means that criticality was a factor explaining the power differences *between* Systems offices and

Collection Development, Human Resources and Public Services, but was not a factor affecting the power difference *between* Systems Offices and Technical Services. Instead, substitutability was the factor affecting differences of perceived power between Systems Offices and Technical Services (β= .311, p<.014). In addition to criticality, centrality was positively related to the differences of the perceived power between Systems Offices and Public Services (β= .269, p<.013) (Table 7).

Second, with respect to perceived influence, criticality was the factor affecting the differences of perceived influence between Systems Offices and other units. In addition to criticality, centrality was a factor affecting differences of perceived influence between Systems offices and Collection Development (β= -.184, p<.049). However, centrality was negatively related to influence. This was an unexpected result (Table 8). One possible reason is described in the section of discussion.

In sum, Systems Offices had more perceived power and influence than all but Public Services. Both Systems Offices and Public Services units were perceived as the most powerful and influential units. However, Systems Offices had less observable power than Public Services. The results were contradictory, suggesting further research. Systems Offices had higher levels on contingency variables than most of the other units, as expected. However, except for "criticality," most of the contingency variables were not good predictors of the power *within* and *between* the units. That is, with respect to perceived power, although there were some variations among units, criticality was the factor affecting perceived power *within* most of the units, and *between* Systems Offices and most of the other units. Coping with uncertainty was not a factor explaining power differences *between* Systems Offices and any of the other units. With a few exceptions,

other contingency variables such as substitutability and centrality were not a predictor of power differences *between* Systems Offices and most of the other units. Finally, criticality was the factor affecting perceived influence *within* and *between* Systems Offices and other units. In short, overall, only one or two contingency variables explained the perceived power or inference differences *within* units, and *between* Systems Offices and other units. Furthermore, among the contingency variables, the additional variable, "criticality" was the important factor in explaining power or influence differences. This implies that Strategic Contingencies Theory may be partially applicable to library settings, and there may be other omitted variables that may explain power differences among units in academic libraries.

Discussion

The study showed that Systems Offices had more perceived power and influence than all but Public Services. There was no evidence that Systems Offices had more observable power than other units. On the contrary, Public Services had more observable power than Systems Offices. Possible reasons for this contradiction may be: First, perceptions of power or influence may differ from actual power. Second, the measures of observable power may not reflect actual power. Or, the measures of observable power may reflect actual power only in a certain type of organization (e.g., private organizations), because there may be differences between public and private organizations regarding financial indicators of "observable power" such as salary and number of new hires. For instance, differences of salary and number of new hires among units may be greater in private organizations than in public organizations because there is more likely to be a wage ceiling or a funding limit in public organizations. If this is the

case, results with respect to perceived power and observable power may be consistent in privately-funded library organizations, but not in publicly-funded library organizations. However, it requires further research to find out whether or not the financial indicators are valid to only privately-funded organizations.

Finally, the culture of academia that values advanced degrees may explain the contradiction. It is expected that the number of staff with advanced degrees in a Systems Offices unit may be smaller than that of other units because a Systems Offices unit prefers individuals with more technical expertise than advanced degrees. In fact, Lim's (2004) finding supports this expectation by showing that the educational levels of the heads of Systems Offices are significantly lower than those of the other units. Overall educational levels of members of a unit may be positively related to unit's organizational activities such as committee involvements and interactions with the library director, which were used as some of the indicators of observable power in this study. This may result in a less observable power of the Systems Offices unit than the Public Services Unit. However, further research is required to validate this argument.

Another unexpected result was that centrality was negatively related to differences of perceived influence between Systems Offices and Collection Development, although its p-value ($p<.049$) is close to the significant level ($\alpha=.05$). One possible reason for the unexpected result may be related to service impact of units on library users regarding time. The services of the Collection Development units are more likely to have long-term impact than short-term impact. On the other hand, the services of Systems Offices are more likely to have short-term impact, which leads to high centrality. This

may make Collection Development units influential on a variety of issues in libraries, although centrality of these units is not high.

Systems Offices had higher levels on contingency variables than most of the other units. However, only one or two contingency variables were related to perceived power or influence *within* the units and *between* Systems Offices and other units. Moreover, among the contingency variables, "*criticality*" was the important factor in explaining power or influence differences. This implies that the original Strategic Contingencies Theory may have limited applicability to library settings. One possible reason for the lack of applicability of the original theory to library organizations may be due to the measures of the study. Since most of the measures for this study were developed the first time for a library setting, the measures need to be further tested and refined. With more evidence, it is possible to discuss the applicability of the theory to library settings. A second reason may be that the original contingency variables such as "coping with uncertainty," "substitutability," and "centrality" may be important factors affecting power in other organizations, but not in library organizations. This may be due to different characteristics between other organizations (e.g., business) and academic library organizations. Finally, there may be omitted variables that explain the power differences in academic library organizations. It requires more empirical evidence to discuss the applicability of the original theory to library settings.

Conclusions

This study examined whether or not Systems Offices had more power than other units and attempted to understand the power differences among the five units based on Strategic Contingencies Theory. As expected, Systems Offices had more perceived power

than most of the other units. However, contrary to the expectation, Public Services had equivalent perceived power to Systems Offices. Furthermore, Public Services had more observable power than Systems Offices. The study findings also showed a partial applicability of Strategic Contingencies Theory to library organizations, which requires further research.

Implications

This study provides the library administration and staff with some practical implications. First, the findings showed that the less dependent the Systems Offices are on campus technology offices, the greater the influence of the Systems Offices on a variety of tasks within the libraries. Systems Offices and other units could increase their influence within library organizations by providing more independent services.

Second, findings suggest that "criticality" was an important power source. Library staff can increase their power/influence by aligning their tasks or services with goals critical to libraries. Similarly, library administrations can also increase the power of libraries by providing critical services to universities. The contents of criticality may vary as the library environment changes.

Third, Lukes (2005) discusses some practical importance of the knowledge of power, and the study findings share the essence of his discussion. Given the knowledge of power of each unit, library administrations can better control each unit in particular circumstances by predicting some possible actions or non-actions that each unit may take. As a result, library administrations can choose effective ways of making decisions and taking actions to achieve desired goals.

Finally, the knowledge of different power sources among units helps each unit correctly read its position within organizations and strategically increase its power by cooperating with other units. As Coleman & Voronov (2003) suggest, given the knowledge of power sources, each unit can assess the strengths and weaknesses of its own and other units, and use their joint resources to promote common goals.

The Limitations of the Study and Further Directions

This study has limitations with respect to both methodology and perspective. Some limitations are from the methodologies that this study employed, while other limitations originated from Strategic Contingencies Theory on which this study was based. First, constructing the measurements was one of the most important and difficult processes of the study. Most measures of this study were designed and used for the first time; these measures need to be further tested and elaborated.

Second, there were some variations in organizational structures of libraries, however, such variations were not considered in this study. For instance, functional units such as Collection Development, Public Services and Technical Services were not clearly divided in some university libraries, and the ways these functional units were combined were not consistent across the population libraries. In addition, most of the university libraries have branch libraries, which may function as independent units, and functional units may support such branch libraries with their services. If this is the case, such branch libraries may affect the power relations among functional units of the main university library. Nonetheless, the variations of organizational structures were not considered in the study. It is desirable to consider such variations because they may affect power relations among the units.

Third, there were some variations regarding hierarchical positions of functional units across the sample libraries. For instance, four Systems Offices units of the study were positioned under either the Technical Services or Human Resources units. The way each of functional units was positioned within their organizations may be an indicator of the power of each of the units. However, such variations were not considered in the study.

Fourth, identifying functional units and unit heads required a lot of work and decision-making due to some structural variations of functional units across the sample libraries and some unclear organizational charts or unclear staff directories regarding their positions. In the process, some of the respondents might be misidentified or selected in a less optimal way. For instance, the respondents of the Joint Functions who oversaw multiple functional units certainly provided valid information regarding each of the functional units; however, for the purpose of the study, they were less desirable respondents because they represented multiple functional units. In addition, as stated elsewhere, the vacancy of a unit head might also inflate the number of the respondents who represented Joint Functions.

Fifth, other limitations of this study are related to the assumptions or perspective of Strategic Contingencies Theory. Strategic Contingencies Theory assumes validity when variables such as quality of department relationships, departmental distance and individual characteristics are the same across departments. These are strong assumptions and such variables may differ from library to library. In addition, there may be other contextual variables such as a unit head's leadership style, and certain library or university culture. With respect to university culture, besides advanced degrees as

mentioned above, the status of librarians in the university may be an important factor affecting power in academic libraries. Currently, a considerable number of academic libraries grant librarians the faculty status, although the percentage of libraries granting the faculty status varies across studies (between 35% and 78%) due to inconsistent definitions of the term "faculty status" (Budd, 2005; Welch & Mozenter, 2006). Such libraries are likely to have a comparable staff evaluation system for promotion and tenure with that of teaching faculty. If this is the case, librarians who perform similar jobs such as teaching and research to the teaching faculty would have more benefits than those who do not regarding their status and/or power. This may also explain why Public Services unit, which involves teaching, had more observable power than Systems Offices unit, or, at least, was perceived as powerful and influential as Systems Offices unit, unlike the prediction of Strategic Contingencies Theory. However, these variables related to the culture of academia were not considered in this study.

Furthermore, this study is only concerned with structural sources of power, ignoring individual sources of power. In addition, Strategic Contingencies Theory reflects a functional perspective of organizational politics in which political processes are assumed to be rational (Bradshaw-Camball & Murray, 1991). Since this study has the same assumption of rationality of political processes, it has the same limitation.

Finally, in conceptualization of power, this study is based on a concept that is more likely to be observable. Some researchers (Coleman & Voronov, 2003; Hardy, 1996; Horton, 2003) pay attention to different views of power such as symbolic and system power. Such power occurs when issues may be prevented from arising at all or people are not even aware of their unconscious acceptance of the cultures. These types of

power may be experienced in library organizations as well. Nonetheless, these views are not considered in the current study in conceptualization of power.

Several suggestions for further research emerged from the current study. There is a great need for research in developing the items measuring the concepts of the study. More empirical evidence is needed to discuss the applicability of Strategic Contingencies Theory to library settings, taking into account a possible omitted variable(s) such as individual characteristics or other contextual variables that reflect the culture of academia. For instance, as stated above, the faculty culture that values educational degrees and teaching duties needs to be further considered as an important factor affecting power in the university libraries. There needs to be testable conceptual models or empirical studies that consider both structural and individual sources of power, as some researchers have attempted (Coleman & Voronov, 2003; Fiol, O'Connor, & Aguinis, 2001; Lawrence et al., 2005). Finally, researchers may explore the same questions using different research methods. Not only would studies employing different methods compensate for the weaknesses of the questionnaire method this study employed, but it would also provide convergent validity of the current study if those studies produce the same results.

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Appendix A. Summary of Operationalization of Research Variables and the Remaining Items Used for Testing Hypotheses

Research Variable	Questionnaire Item
Coping with Uncertainty	How well has each of the following units coped with budget change from the parent university in the past two years? How well has each of the following units managed increasing/ or evolving electronic resources in the past two years? How well has each of the following units dealt with problems associated with restrictive licensing terms of electronic resources in the past two years? How well has each of the following units taken appropriate actions in the past two years to effectively resolve any problems of campus-wide networks? How well has each of the following units taken appropriate actions in the past two years to ensure the performance of library networks? How well has each of the following units taken appropriate actions to resolve any problems related to the integrated library systems in the past two years? How well has each of the following units dealt with problems associated with the implementation of new software for library services (for instance, live reference, ILL etc.) in the past two years? How well has each of the following units managed any problems associated with staff changes or staff leaving in the past two years?
Substitutability	**A. All Units** To what extent could other units do any of the characteristic tasks of each of the five units? **B. Systems Offices Only** To what extend is the campus technology office involved in tasks concerning your unit? What percentage of the unit's projects has the campus technology offices been involved in during the past two years? To what extent does your unit need to have the consensus of other units in cooperating or contacting a project with the campus technology offices?
Centrality	How quickly would the elimination of tasks of each of the following units affect patrons' use of library services? How seriously would the elimination of tasks of each of the units affect patrons' use of library services?

Research Variable	Questionnaire Item
Criticality	**A. Criticality of each of the goals** To what extent is each of the following goals critical for your library at the present time? a. Raising funds b. Efficient use of available funds c. Improving physical collections d. Improving access to information e. Managing or upgrading of computer technologies f. Improving user services g. Improving processing resources h. Ensuring qualified staff through training or hiring i. Improving library facilities j. Communicating with internal/external customers **B. Contributions to each of the goals** c. To what extent does each of the following units contribute to Improving physical collections? d1. To what extent does each of the following units contribute to improving the contents of library web pages for public? d2.To what extent does each of the following units contribute to improving interfaces of the web pages with respect to either designs or ease of use? d3. To what extent does each of the following units contribute to improving technical capability of access to the library web pages? d4. To what extent does each of the following units contribute to digitalization of resources? d5. To what extent does each of the following units contribute to implementation of software for access such as ILL software, live reference, etc? e. To what extent does each of the following units contribute to managing or upgrading of computer technologies? f. To what extent does each of the following units contribute to Improving face-to face or online user services such as bibliographic instruction or live reference? g. To what extent does each of the following units contribute to improvement of processing of library resources for use? i. To what extent does each of the following units contribute to Improving library facilities such as space, furniture, copiers, etc?

Research Variable	Components	Questionnaire Item
Power	**Perceived Power**	How much power does each of the following units have in general?
	Perceived Influence	How much influence does each of the following units have on each of the decision issues? a. Implementation of new software b. Web development c. Digitalization of resources d. Budget allocations among units e. Job reallocations f. Creating new positions g. Staff training and development h. Library facilities i. Library policies
	Observable Power	In how many library committees, of which the library director is a member, are you involved? On average, how many times each week do you meet with the library director? On average, how many times each week does the library director consult you or your unit? How many new professional staff has your unit hired within the past two years? What is your gross salary at present?

Notes:
1. Substitutability: The item A was used to measure the substitutability of each of the units within the library, while the three items under the category of B were used to measure the substitutability of Systems Offices in relation to the Campus Technology Office.
2. Criticality: Initially, 15 items were used to measure the contributions of each of the units to each of the ten goals. Five items (d1-d5) measured the item of the contribution to access to information. Only the 10 items (c, d1-d5, e, f, g, and i) were used for hypothesis tests based on reliability tests. Taking into account the weight of each of the items of A, responses to each of the items of B were recalculated, and the recalculated values were used for hypothesis tests.
3. Power was measured in three different ways: perceived power; perceived influence and observable power.

Appendix B. Sample Questionnaire Items

The following format was used for questions about coping with uncertainty, centrality, criticality and power (perceived power and influence).

How seriously would the elimination of tasks of each of the following units affect patrons' use of library services?	Not at all	Only a little	Somewhat	Mostly	Entirely	Don't know	Not applic-able
Collection Development	1	2	3	4	5	D/K	N/A
Human Resources	1	2	3	4	5	D/K	N/A
Public Services	1	2	3	4	5	D/K	N/A
Systems Office	1	2	3	4	5	D/K	N/A
Technical Services	1	2	3	4	5	D/K	N/A

The following format was used for questions about substitutability.

To what extent could other units do any of the characteristic tasks of the Systems Office unit?	Not at all	Only a little	Somewhat	Mostly	All	Don't know	Not applic-able
Human Resources	1	2	3	4	5	D/K	N/A
Public Services	1	2	3	4	5	D/K	N/A
Systems Office	1	2	3	4	5	D/K	N/A
Technical Services	1	2	3	4	5	D/K	N/A

The following format was used for questions measuring observable power.

How many new professional staff has your unit hired within the past two years?
☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-6 ☐ 7 or more

The following format was used for questions for Systems Offices only.

	Not at all	Only a little	Some	A great deal	Absolutely	Don't know
To what extent is the campus technology office involved in tasks concerning your unit?	1	2	3	4	5	D/K
What percentage of your unit's projects has the computer technology office been involved in during the past two years?	0%	1-30%	31-60%	61-90%	91-100%	D/K

Note: The questionnaire was built on the survey instrument developed by Hinings et al. (1974)

Table 1. Paired t-tests on Perceived Power

Pair	Mean difference	Std. Deviation	Std. Error Mean	t	df	P-Value
CD-SYS	-.207	.523	.056	-3.698	86	**.000**
HR-SYS	-.444	.778	.084	-5.266	84	**.000**
PS-SYS	-.079	.571	.061	-1.309	87	.194
SYS-TS	.340	.560	.060	5.701	87	**.000**

Tested Variable: Perceived Power, α = .05

Table 2. Paired t-tests on Perceived Influence

Pair	Mean difference	Std. Deviation	Std. Error Mean	t	df	P-Value
CD-SYS	-3.288	3.821	.412	-7.979	85	**.000**
HR-SYS	-3.838	5.532	.596	-6.434	85	**.000**
PS-SYS	.195	3.586	.387	.503	85	.616
SYS-TS	3.684	3.256	.351	10.494	85	**.000**

Tested Variable: Perceived Influence, α = .05

Table 3. Pair-wise t –tests on Observable Power (Bonferroni procedure)

(I) UNIT	(J) UNIT	Mean Difference (I-J)	Std. Error	t	P-Value
SYS	CD	-1.446	.6943	-2.083	.384
	HR	-1.255	.6808	-1.844	.666
	PS	-2.308	.6548	-3.525	**.005**
	TS	.7585	.699	1.085	1.000

Dependent variable: Observable power , α = .05

Table 4. Paired t-Tests on Contingency Variables

Coping with Uncertainty

Pair	Mean difference	Std. Dev	Std. Error Mean	t	df	P-Value
CD-SY	-3.372	2.703	.306	-11.021	77	**.000**
HR-SY	-5.924	2.525	.292	-20.316	74	**.000**
PS-SY	-2.747	2.722	.308	-8.914	77	**.000**
SY-TS	2.783	3.084	.345	8.069	79	**.000**

Tested Variable: Coping with Uncertainty , α = .05

Substitutability

Pair	Mean difference	Std. Dev	Std. Error Mean	t	df	P-Value
CD-SY	-.702	.540	.0576	-12.196	87	**.000**
HR-SY	-.299	.530	.0571	-5.250	85	**.000**
PS-SY	-.663	.471	.0505	-13.121	86	**.000**
SY-TS	.212	.408	.0435	4.887	87	**.000**

Tested Variable: Substitutability, α = .05
The higher the score, the less substitutable.

Centrality

Pair	Mean difference	Std. Dev	Std. Error Mean	t	df	P-Value
CD-SY	-2.340	1.255	.134	-17.497	87	**.000**
HR-SY	-3.425	1.455	.159	-21.582	83	**.000**
PS-SY	.0972	1.230	.131	.741	87	.461
SY-TS	1.520	.913	.097	15.615	87	**.000**

Tested Variable: Centrality, α = .05

Criticality

Pair	Mean difference	Std. Dev	Std. Error Mean	t	df	P-Value
CD-SY	-10.033	6.419	.718	-13.981	79	**.000**
HR-SY	-23.880	5.491	.623	-38.409	77	**.000**
PS-SY	-1.668	5.769	.641	-2.602	80	**.011**
SY-TS	8.608	5.622	.633	13.609	78	**.000**

Tested Variable: Criticality, α = .05

Table 5. Regression Analysis on Perceived Influence Regarding Systems Offices

Variables	Standardized Coefficients	t	P-Value	Part Correlations
CampTech	-.362	-2.592	**.013**	-.353
Consensus	-.122	-.871	.388	-.119

Dependent Variable: Perceived Influence
CampTech: the degree of involvement of the campus technology office in the Systems Office
Consensus: the degree of the need of having the consensus of other units

N=48, R^2 = .166, α = .05

Table 6. Multiple Regression Analysis on Perceived Power

Collection Development

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
Coping	.324	2.807	**.006**	.285
Substitutability	.075	.735	.465	.075
Centrality	.167	1.557	.124	.158
Criticality	.201	1.821	.073	.185

Dependent Variable: Perceived Power
N=75, R^2 = .278, α = .05

Human Resources

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
Coping	.033	.258	.797	.029
Substitutability	.113	.946	.348	.108
Centrality	.090	.697	.488	.079
Criticality	.329	2.757	**.008**	.315

Dependent Variable: Perceived Power
N=71, R^2 = .141, α = .05

Table 6 (Continued)

Public Services

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
Coping	.145	1.229	.223	.133
Substitutability	.077	.677	.501	.074
Centrality	-.119	-.998	.322	-.108
Criticality	.347	2.987	**.004**	.324

Dependent Variable: Perceived Power N=76,
R^2 = .163, α = .05

Systems Offices

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
Coping	.178	1.463	.148	.149
Substitutability	.112	1.049	.298	.107
Centrality	-.006	-.051	.960	-.005
Criticality	.382	3.087	**.003**	.315

Dependent Variable: Perceived Power
N=77, R^2 = .252, α = .05

Technical Services

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
Coping	.228	1.828	.072	.201
Substitutability	.241	2.137	**.036**	.235
Centrality	.022	.192	.848	.021
Criticality	.023	.193	.847	.021

Dependent Variable: Perceived Power
N=77, R^2 = .13, α = .05

Table 7. Regression Analyses on Differences of Perceived Power

Systems Offices Versus Collection Development

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.025	.216	.829	.023
DiffSubstitutability	.159	1.350	.181	.145
DiffCentrality	.208	1.868	.066	.201
DiffCriticality	.250	2.017	**.048**	.217
Dependent variable: difference of perceived power between SYS and CD				N=74, R^2 = .200, α = .05

Note: DiffCope, DiffSubstitutability, DiffCentrality and DiffCriticality refer to differences of each of contingency variables for each of the pairs.

Systems Offices versus Human Resources

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.084	.697	.489	.079
DiffSubstitutability	-.141	-1.179	.243	-.133
DiffCentrality	.192	1.572	.121	.177
DiffCriticality	.304	2.556	**.013**	.289
Dependent variable: difference of perceived power between SYS and HR				N=74, R^2 = .172, α = .05

Systems Offices versus Public Services

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.083	.726	.470	.071
DiffSubstitutability	.038	.371	.712	.036
DiffCentrality	.269	2.560	**.013**	.250
DiffCriticality	.379	3.285	**.002**	.321
Dependent variable: difference of perceived power of SYS and PS				N=74, R^2 = .341, α = .05

Systems Offices versus Technical Services

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.139	1.096	.277	.123
DiffSubstitutability	.311	2.523	**.014**	.282
DiffCentrality	-.063	-.559	.578	-.063
DiffCriticality	-.106	-.852	.397	-.095
Dependent variable: difference of perceived power of SYS and TS				N=75, R^2 = .123, α = .05

Table 8. Regression Analyses on Differences of Perceived Influence

Systems Offices Versus Collection Development

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.026	.278	.782	.025
DiffSubstitutability	-.059	-.607	.546	-.053
DiffCentrality	-.184	-2.007	**.049**	-.177
DiffCriticality	.733	7.079	**.000**	.624
Dependent variable: Difference of perceived influence between SYS and CD				N=72, R^2 = .480, α = .05

Systems Offices versus Human Resources

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.151	1.567	.122	.141
DiffSubstitutability	-.038	-.399	.692	-.036
DiffCentrality	.023	.237	.814	.021
DiffCriticality	.632	6.670	**.000**	.601
Dependent variable: Difference of perceived influence between SYS and HR				N=69, R^2 = .481, α = .05

Systems Offices versus Public Services

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.059	.571	.570	.050
DiffSubstitutability	.023	.250	.803	.022
DiffCentrality	.057	.605	.547	.053
DiffCriticality	.639	6.174	**.000**	.542
Dependent variable: Difference of perceived influence between SYS and PS				N=72, R^2 = .484, α = .05

Systems Offices versus Technical Services

Variables	Standardized Coefficients (β)	t	P-Value	Part Correlations
DiffCope	.106	.969	.336	.094
DiffSubstitutability	.108	1.009	.316	.098
DiffCentrality	-.014	-.140	.889	-.014
DiffCriticality	.497	4.566	**.000**	.444
Dependent variable: Difference of perceived influence between SYS and TS				N=73, R^2 = .356, α = .05