Towards a
Contingency Approach
Of Information Center Management

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ABSTRACT

As the use of personal computers in business organizations became more widespread in the last decade, the need to provide support or help has increased. Many companies responded by implementing End User Support Groups, or Help desks, or what have come to be known as Information Centers (ICs). Throughout this paper the term Information Center will be used for all three of these approaches. An IC is a method of providing non-computer professionals with access to modern computing technology. (IBM, 1984A.) An IC provides its users with tools, services, and ongoing support which allows the end-users to do a substantial portion of their computer related work for themselves. (Hammond, 1984.)

INTRODUCTION

Early on much attention in the trade press and at conferences was paid to the issue of what an IC should be and what it should do. (Benson, 1983; CRWTH, 1986; IBM, 1984C; Smith, 1983.) Later, critical attention began to be paid to the issue of the best way to manage an IC. (Guimares and Ramanujam, 1986), (Wang, 1995). Research efforts shifted from determining what was being done to what was most effective. (Norcons, 1998; Winter, Chudoba and Gutek, 1997; Pui, 2002; Govindarajulu, 2002).

The use of ROI (return on investment) as a success criterion was replaced by a measure of effectiveness, user satisfaction. User satisfaction was found to be greater in those organizations which had an IC with a full range of services backed by integrated planning (Bergeron and Berube, 1988), and was found to be a function of both technological and organizational factors (Rivard, 1987; Snitkin and King, 1986; and Aladwani, 2002), and was found to depend upon perceived usefulness and ease of use (Davis, 1989), and related to the users' technological frames of reference, (Shaw, et. al., 2003)

Organizational issues began to warrant consideration, such as the positioning of the IC services in the organization (Christy and White, 1987; Guimares, 1997; Speier and Brown, 1997), organizational communications patterns (Ledbetter, Snyder and Cox, 1985), organizational philosophy and goals for EUC (Christy and White, 1987), formality of objectives, goals, and policies (White and Cristy, 1987), and relationship between organizational and IS goals (Zviran, 1990).

The maturation of the field of inquiry is also reflected in publication of more theoretically focused works which suggest a new framework for evaluation (Cale and Curley, 1987), linking information technology, integration, and organizational change (Benjamin and Scott Morton, 1988), and organizational strategy for managing the new technology (Pava, 1983), a meta model for end user training, (Desai and Richards, 1999), and development of a structural model, (Igbaria, Zinatelli, Gregg and Cavaye, 1997) and also

cross-cultural research (Igbaria and Zviran, 1996.)

This maturation is also reflected in recent studies with methodological perspectives, focusing on the validity or accuracy of measurements of user satisfaction (Galetta and Lederer, 1989; Conrath and Mignen, 1990; Tan and Lo, 1990; Marco, 1998; McHenry, et. al.; 2002; Shayo and Guthrie, 1999; Harris, 2000; and Au, et. al., 2003).

The next section will discuss other research that can be useful in understanding the effects of IC implementation.

CONTINGENCY APPROACH

The current organizational thinking with respect to contingency theory can be summarized in two statements:

1. There is no one best way to organize.
2. Any one way of organizing is not equally effective under different conditions.

What are the characteristics of organizational contexts which appear to make a difference? Several answers to that question have come out of research efforts.

The now classic Woodward and Burns and Stalker studies found a contingency relationship with organization structure. (Woodward, 1965; Burns and Stalker, 1961). Central to contingency theory is the notion that the various elements within the system need to fit together.

> "FIT concerns the broad-scale orientation of the organization toward its environment and its internal components - the appropriateness of structure to: technology, members of the organization as individuals and as a social system, and to the environment." (Jelinek, Litterer, and Miles, 1986).

This concept of consistency or fit between components of an organization is supported by substantial research; (Kotter, 1978) outcome measures, reward systems, (Porter and Lawler, 1968), job design, (Hackman, 1977), organization structure, (Morse and Lorsch, 1970), performance evaluation, (Miner, 1968), organizational climate, (Schneider, 1972), and organization structure (Morse and Lorsch, 1970).

The power of contingency theory was further substantiated in a field study of 27 nursing units by Alexander and Randolph (1985). In their analysis of the relationship between technology, structure, and performance, they found that a measure of the FIT between technology and structure was a better predictor of performance than were measures of technology or structure alone, or the two together. Their study showed that the relationship between the components was a more significant determinant of performance than were the characteristics of those components. This has interesting implications for organization design theiorists and practitioners alike, as technology continues to be adopted in the office or white collar environment.

INFORMATION CENTER RESEARCH

Many of the initial evaluation efforts were intended to show that the IC approach to managing technology was cost effective. ROI, return on investment ratios, figured prominently. (Yowell, 1981). One division of a major corporation used a quasi-experimental design to evaluate a pilot project to determine if savings warranted full implementation, which did occur (Lederer et al., 1987). At the simpler end of the spectrum, interviews with only six IC managers provided the basis for assessing relationships in an IC environment (Christy and White, 1987). Table 1 presents a summary of typical research on Ics.

Three of these studies focused on management issues. One, based upon interviews, related organizational position of the IC, the philosophy and goals of the organization, and the

effective user support and management of the IC are dependent upon rather formal objectives, goals, and controls. (Alavi & Freedman, 1990). This represents the control side of the promote/control implementation strategy mentioned above. Three of these studies took a user (rather than a manager) perspective. Usage and user satisfaction were the dependent variables in these studies. High levels of satisfaction (or a surrogate measure, usage) were associated with two groupings of factors. These can be summarized in terms of the technological and organizational factors identified by Rivard (1987). Methodological issues are beginning to be discussed and tested as reflected in the final 4 articles.

At a slightly higher level of abstraction, most of these studies all use a similar conceptual model, of the form $Y = f(X)$. That is, the dependent variable, whether user satisfaction or effective management, is reported to be a function of one or more characteristics of the IC. These simple methodologies did suffice in exploratory research, but investigation of ICs has moved beyond that stage.

The universalist model described above $[Y = f(x)]$ can be replaced by a contingency model $[Y = f(X, Z)]$, where Z represents a moderating or a contingency variable. This model allows for analysis of the relationships between IC characteristics (X) and satisfaction (Y) and the impact that organization structure (Z) has on that relationship. This perspective is more in keeping with current organizational research and links the findings with respect to ICs to a broader range of companies and researchers.

To put that contingency view into terms more specific to this study, it can be argued that the management of an IC should be contingent upon the design of the organization into which it is being introduced. If the formalization aspect of organization structure is considered in this context, a contingency approach would suggest that either a high or a low level of formalization in an IC could be more successful contingent upon the organicity (Mechanistic/organic orientation) of the total organization. This implies that the relationship between formalization of the IC and IC success is moderated by the overall organization's structural orientation, and that success for the IC is a function of the fit between these two structural aspects.

Table 1. Summary of Selected IC Research

Researchers	Independent Variables	Dependent Variables	Methodology
Management Oriented:			
Vijayraman and Ramakrishna, 1991	Organizational Position of IC Organizational Goals Promote/Control Strategy	Relationship to MIS Service Mix	Interviews
Magal and Carr, 1988	Age and Size of IC Hardware Option	26 Critical Success Factors	Mailed Questionnaire
Alavi, Phillips and Freedman, 1990	Formal Objectives & Goals Formal Policies	Effective support and management of IC in 6 firms	Interviewed managers and users
Satisfaction Oriented:			
Bergeron et al., 1990	Micro Plan/Master Plan Existence of IC Access to Hot Line	End User Satisfaction	Questionnaire
Rivard, 1987	Technological and Organizational Factors	End User Satisfaction	10 Firms, 95 Interviews and 272 Questionnaires
Lehman, 1997	Characteristics of User, Application and System Effectiveness	Personal DSS Usage	Mailed Questionnaire
Igbaria and Nachman, 1990	Individual and Organizational Factors	Use/Satisfaction	Questionnaire
Method Oriented:			
Cale and Curley, 1987	IS Implementation Framework for Evaluation	WHO uses – for WHAT purpose	Field Study 19 units of one firm
Moore and Benbasat, 1992	Measurement of User Satisfaction	Scale Validity	Experimental
Ledbetter, Snyder and Cox, 1985	Organizational Communications, Attitudes towards OA Climate	OA Readiness	Questionnaire
Etzadi-Amoli and Farhoomand, 1996	Six Attitudinal Factors	User Satisfaction	Structural Equation Modeling

promote/control implementation strategy, to the mix of services and closure. (Vijayraman & Ramakrishna, 1991).

Data from over 1,400 IC managers was used to link the age and size of the IC, along with its micro/mainframe option, to 26 Critical Success Factors (CSFs) (Magal and Carr, 1988). The third of the management oriented articles suggests that

Contingency models, by definition, hypothesize that the relationship between two variables is contingent upon some third variable, and as a result, researchers have been concerned with the issue of whether moderator variables interact with independent variables in some predictable fashion (Arnold, 1982). The basis for this prediction is a priori theorization. The conceptual model

that is the basis for this study, in almost global terms, says the relationship between the characteristics of the IC and its success is contingent upon the structure of the total organization. To be viable as a guide to research, these global terms must become more specific. Which IC characteristics? What is success? Which aspect of structure? What form of relationship? (Venkatramann, 1989)

There are a myriad of possibilities. But since this research covers new grounds, a conservative, even cautious, first step is warranted. At the organization level, the mechanistic/organic aspect of structure will be used as the moderating variable. Research involving organization structure has many antecedents. Organ and Greene, (1981) examined the effects of organizational formalization on alienation. The Glisson and Martin (1980) model of organizational efficiency posits formalization (and centralization) as moderator(s) of organization size and age. Formalization was one of the aspects of structure related to role conflict and ambiguity in a study of the non-academic employees of a major university (Morris, Steers, and Koch, 1979).

The main characteristic of design of the IC which was used in this study was formalization. This was in keeping with the conservative first step strategy. Two contrasting styles of IC management exist at opposite ends of the formalization continuum. Some authors espouse a "laissez faire" marketing based approach, (Carr, 1987; Greenberg, 1988; Merlyn, 1987; Smith, 1983; Stevens, 1987), while others argue that a high degree of formality, with specific policies and procedures, is a better approach (Johnson & Raymond, 1994; Alavi, 1985; Thorn, Guynes and Guynes, 1990; White and Christy, 1987; Coppola, 1987; Guimares and Ramanujam, 1986; Leitheiser and Wethebe, 1984). This is referred to as the promote vs. control strategy. (Lee, 1986; Christy and White, 1987)

Can there be differences in these variables within the same organization? Could there be an "informal" IC in an organization which is highly mechanistic? Yes, this (and the corollary condition) is quite feasible. Organization structure has been measured at the level of the total organization, what is called the dominant structure, as well as at lower levels (Ford, 1979; Fredrickson (1986). The macro-organization theorists are perhaps best represented by the Ashton researchers and the Weberian perspective (Pugh, et al., 1968; Hinnings and Lee, 1971). The micro-organization perspective was the basis for research by Van de Ven and Delbecq (1974), Blackburn and Cummings (1987), Fry and Slocum (1984), and Alexander and Randloph (1985). Hall (1962) found different structures within organizations to be effective, i.e., an organic R&D department and a mechanistic production department.

The dependent variable in the model, IC success, was defined using the satisfaction criterion discussed earlier.

There are beginning to be some research efforts that at least suggest some insights at this level, if not yet overtly specifying factors exactly in this context. Christy and White (1987)

Organization Structure

IC Formalization	Mechanistic	Organic
High	FIT	MISMATCH
Low	MISMATCH	FIT

(Figure-1)

identify "promote" vs. "manage" orientations. Lee (1986) discussed two subsets of his populations using characteristics which match the manage/promote labels, but he stopped short of using these labels, or others. Promote vs. control management strategies were found to be related to the level of problems users encountered in an empirical study by Guimares and Ramanujam. (1986). What these studies are starting to get at is a typology of IC Management, which can be related to Figure 1. The control or manage strategy could be expected to map onto the mechanistic - high cell in the matrix, and the promote, or laissez faire strategy, fits with the organic low cell. Strategy labels for the other cells are not so readily available.

Another way to visualize this contingency relationship is depicted in Figure 1. This 2 x 2 matrix splits the sample into subsets depending upon high or low ratings on the formalization and organicity measures. In each cell would be the average of the satisfaction measures for the organizations in that subset. The upper left hand cell includes those companies which are considered to be mechanistic and which are rated high on IC formalization. The lower right hand cell includes those companies considered to be organic and which are rated low on IC formalization. In both of these instances there is a FIT, a congruence, between the two structural measures. Contingency theory posits that the satisfaction measures in these cells will be higher than in the other two cells where a mismatch condition exists.

HYPOTHESES DEVELOPMENT

Given the above discussion, the assertion can be made that the varying degrees of success of ICs can be explained in a coherent manner relating to organization structure. Hypothesis 1 states the central contingency proposition. The second one takes more of a process focus. That is, do the relationships suggested by Alexander and Randolph also hold in this setting?

There is a trend in the IC/EUC literature which suggests that greater formalization and control is related to higher success or satisfaction in the IC environment (White and Christy, 1987; Magal and Carr, 1988; Bergeron and Berube, 1988; Carr,

Young and Rainer, 1990). By the addition of the moderator variable of overall organization structure, it is anticipated that a more complete theoretical basis can be formed for making such assertions, and under which circumstances such assertions can be held to be true (Parasuraman, et al., 1989). Considering the notion of congruence or fit between the two structural variables, following Schoonhoven's (1981) methods, it is hypothesized that:

H_{1a}: The impact of IC formalization on user satisfaction is nonmonotonic over the range of organicity.

H_{1b}: When organicity is low (mechanistic), increases in IC formalization will positively influence user satisfaction.

H_{1c}: When organicity is high (organic), increases in IC formalization will negatively influence user satisfaction.

A second proposition is based upon the work of Alexander and Randolph (1985). They found that their measure of fit (in the contingency model context) between structure and technology was a better predictor of performance than any of their independent measures. Thus, in the nature of a replication study, it is hypothesized that:

H_2: The measure of the fit between the level of formalization in the IC and the organicity of the total organization will be a better predictor of IC satisfaction than either of those measures independently.

Alexander and Randolph used a difference score between their independent variables as a measure of fit. In this study that translates to the measure of fit being the difference between the average of organicity scale scores and the IC formalization score for each organization.

RESEARCH DESIGN

The nature of this research, i.e., investigation of relationships in an ongoing business organization, is almost by definition a field study. While the field study lacks the manipulation of independent variables, it does provide for significant advantages in terms of realism, significance and strength of variables. (McGrath, 1982) As the unit of analysis for this research is the organization, it was necessary to survey a sizeable number of organizations.

The types of data to be gathered for this study dictated that two separate questionnaires be utilized. One gathered information from the IC managers about the IC and demographic data about the organization. The second questionnaire collected the organizational level structural data and the user satisfaction and utilization data, as well as some demographic data.

STRUCTURE

There has been, in recent years, a great deal of research on the dimensions of structure. Two methodological approaches to the measurement of structure have evolved (Sathe, 1978). Some researchers (Hage and Aiken, 1967; Duncan, 1971; Hitt and Middlemast, 1979) have adopted a questionnaire approach where responses from organizational members are aggregated to obtain measures of structure. Ford, (1979) found that the questionnaire approach taps the emergent structure, that reality with which the members of the organization interact on an ongoing basis, and which influences their behavior. The questionnaire approach was used in this study to collect individuals' perceptions about the structure construct. In this study, to assess the degree of formalization of the IC, the IC managers were asked to respond to the formalization scale from the House and Rizzo (1972) Organizational Practices Questionnaire.

ORGANICITY

At the level of the total organization, structure is frequently conceptualised using the mechanistic/organic orientation developed by Burns and Stalker (1961). Khandwalla (1972) developed an instrument to assess the mechanistic vs. organic orientation of a firm. Covin and Slevin (1988) derived from that instrument a seven item scale for organicity - the extent to which an organization is structured in an organic or a mechanistic manner. The Covin/Slevin scale was used to assess the structure of the companies in this study.

SATISFACTION

The measure of user satisfaction was based upon Magal and Carr's (1988) composite critical success factors (CSFs). Magal and Carr found that three of these CSFs were considered to be the most important regardless of the size or age of the IC, the number of users supported, or the micro/mainframe option. Those three composite CSFs are:

Factor 1. Commitment to the IC concept.
Factor 2. Quality of IC support services.
Factor 3. Facilitation of end user computing.

The IC users were asked to indicate on a five point scale to what extent they are satisfied with the items which constitute the CSFs.

The data collection package which was mailed to IC managers consisted of a cover letter to the manager, one questionnaire to be completed by the manager, and eight questionnaires for users, with a cover letter to the users as part of the questionnaire. Both questionnaires utilize the "no postage needed" feature.

DATA COLLECTION

Several things were done to enhance the probability of a high response rate to the mailed questionnaires, with convenience to the respondents and professional appearance the guiding objectives. The survey instruments were printed so that each was on only a single page. Each survey was designed so that no envelope was required; the form only had to be folded, taped, and put into the mail.

The surveys were mailed to 200 IC managers using labels generated from the mailing list of Information Center Magazine. The labels represented a random selection of subscribers to the magazine who indicated that they were IC managers. Since data had to be collected from both the manager of an IC and also from some of the users of that IC, the mailing consisted of one manager survey and eight user surveys, which the manager was asked to distribute to eight of his or her "typical" users. Beginning three weeks after the initial mailing, extensive telephone follow-up calls were made to non-respondents. In some cases, four follow-up calls were made. Response rates for both the manager and the user surveys were follows: 29.2 % Manager Response rate (57 of 195) and at the individual level, a 30.0 % response rate was seen (137 of 456). Every one of the questionnaires returned was filled out correctly and the data were usable.

ANALYSIS

The data gathered via this mailed survey process can be grouped into six categories:

(From the IC Manager Questionnaire)

1. Demographic or descriptive data about the companies and their ICs,
2. A nine item scale to measure IC formalization,
3. Demographic data about the manager

   (From the User questionnaire)

4. A five item scale to measure overall company organization structure
5. A sixteen item scale to measure user satisfaction
6. Demographic data about the user

The categories of questions which ask about technology utilization and about company or individual demographics are not additive and will be treated as discrete items. The other three categories of questions were designed to be averaged into a single measure or scale. The data relating to these scales will be discussed first, followed by the demographics. For ease of discussion, the following labels will be used in discussing these scales:

ICF = Information Center Formalization
ORG = Organicity
SATIS = User Satisfaction

The first, ICF, is the average of the nine responses from the IC Managers. The second and third are aggregated averages of the responses from the users of that company's IC. Thus, for each company in this study there is single score for each of these scales.

SCALE VALIDATION

The data for the three scales was analysed for reliability. The inter-item reliability of these scales, indicated by the calculation of Chronbach's Alpha statistic is

For   ICFORM   0.9280.
        ORG   0.8422
        SATIS   0.8822

DEMOGRAPHIC ANALYSIS

The CRWTH Corporation has done many surveys of Information Centers over the years. The demographics from their 1988 survey was used for comparison purposes and by inspection it was determined that the sample used in this study was a representative sample of companies and ICs in the United States. There was a good distribution of industries represented in this sample; 33% manufacturing, 23% banking/finance, 11% government agencies; and 12% "other". Based upon these demographic data on the companies which have responded to this survey, it is reasonable to conclude that these companies represent a good cross section of the total population in the country, and thus the findings of this study can be applicable to that broader audience.

Of the 57 managers responding to the survey, 36 were males and 21 were female, 63% and 37% respectively. Eighty per cent indicated that they were college graduates. Ages ranged from 23 to 51. Fifty-three percent said they were first line managers, twenty-five percent middle managers, one top management, and twenty-one percent were professional level. Of the 137 users responding, 66% were male and 34% were female, a very similar proportion to the manager population. Only 53% of the users were college graduates, but 25% had done post-graduate work. User ages ranged from 20 to 61, with the average being 36. Five of the users indicated they were in top management positions, 21 in middle management, 22 in first line management, the bulk of the users, 76 of them, or 55% were in professional positions, and 13 were in clerical positions.

HYPOTHESIS TESTING

The matrix below (Figure 2) is a replication of Figure 1, which was used to help illustrate the contingency focus. Each cell contains the number of companies which fall into that cell, and the average of the satisfaction scale values for those companies. Each of the 57 companies responding was assigned to a particular cell based upon whether it was above or below the mean of the two scales, Organicity and IC Formalization. The mean of the organicity scale was 3.884; the mean of the IC formalization scale was 4.039. Thirty of the companies were rated as mechanistic and twenty-seven were rated organic. Twenty-five were rated as high on

formalization and thirty two as being low on formalization.

The basic premise of the contingency proposition is that when there exists a fit or a match between the organicity of the company and the formalization of the Information Center, the users will be more satisfied than in those situations where a mismatch occurs. For a company that was seen by the respondents as being organic, the fit is to have an IC that is low on formalization. For a company that was seen by the respondents as mechanistic, the fit is to have an IC which is high on formalization. To rephrase that in the

Organization Structure

IC Formalization	Mechanistic Low	Organic High
High	Cell 1 FIT SATIS = 4.9247 N = 14	Cell 2 MISMATCH SATIS = 4.3492 N = 11
Low	Cell 3 MISMATCH SATIS = 3.8667 N = 16	Cell 4 FIT SATIS = 4.9072 N = 16

Figure 2 Average Satisfaction Values

context of Figure 2, that is to say that the average satisfaction of the companies in cells 1 and 4 will be significantly higher than the average satisfaction found in cells 2 and 3. Inspection of the data in the table indicates that the two Fit cells do contain companies with average satisfaction values higher than the mismatch cells. But one needs to inquire if the differences observed are large enough to be considered significant, and further, is there a pattern to the differences? These questions, and others, will be answered below.

Seeing data cast into a two-by-two matrix, as in Figure 2 brings to mind a classic two way analysis of variance design. The ANOVA procedure tests to see what proportion of the variance in the dependent variable, satisfaction, can be accounted for by IC formalization, by organicity, and by the interaction of those two independent variables. The ANOVA results are depicted in Table 2.

Satisfaction by Organicity and IC Formalization

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig. Of F
Main Effects	5.439	9	.604	1.304	.268
IC Formalization	3.263	5	.647	1.397	.248
Organicity	3.383	4	.846	1.825	.145
2-way interactions	15.389	10	1.539	3.320	.004
Explained	20.827	19	1.096	2.365	.012
Residual	17.148	37	.463		
Total	37.975	56	.678		

N = 57   **Table 2 Analysis of Variance**

The interpretation of these results is rather straightforward. Neither IC formalization nor organicity by themselves, as main effects, can account for a significant amount of the

variance in satisfaction. However, the interaction of those two is significant at the .004 level.

To reach a more thorough appreciation of the relationships among satisfaction, IC formality and organicity, one can turn to some the more recent methodological innovations. The first hypothesis states the central contingency premise of this study. In the elaborated form recommended by Schoonhoven (1981), the first assertion is that:

H_{1a}: The impact of IC formalization on user satisfaction is nonmonotonic over the range of organicity.

H_{1b}: When organicity is low (mechanistic), increases in IC formalization will positively influence user satisfaction.

H_{1c}: When organicity is high (organic), increases in IC formalization will negatively influence user satisfaction.

The relationship between IC formalization (ICF) and user satisfaction (SATIS) is different, depending upon whether the total organization is seen as organic or mechanistic (ORG). The second and third sub-hypotheses specify how this difference is manifested. The statement of these hypotheses and the testing procedure is based upon Schoonhoven's 1981 Administrative Science Quarterly work.

These hypotheses are stated within the context of the simple two variable regression, which includes one first order interaction term.

$$Y = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + e; \text{ where } Y = SATIS; \quad X_1 = ORG;$$
$$X_2 = ICF;$$
$$\text{and } X_1X_2 = \text{interaction between ORG and ICF.}$$

In the above regression, the interaction term, if significant, may be interpreted as changing the coefficient b1 or b2. If the first were the case and one interprets the interaction as altering the effect of X1 on Y, that is, organicity upon satisfaction, then the following partial of the regression equation would be analysed: $Y = b_1X_1 = b_3X_1X_2$ or $Y = X_1 (b_1 + b_3X_2)$.

In this case, the interest is primarily in the behavior of X_1 and how its effect is modified by X_2. Schoonhoven states that from a mathematical point of view, one could just as readily interpret the interaction term as affecting the relationship between X_2 and Y. In this second case we would analyse the following partial regression equation: $Y = b_2X_2 = b_3X_1X_2$, $Y = X_2(b_2 + b_3X_1)$. This would imply an interest in the effect of X_2 on Y and how its effect is modified over the range of X_1. The

choice of the two partials is determined by the substantive assumptions that one is willing to make. Mathematically, the two are equally valid. When analysing the interaction term in this analysis, the position is taken that the structure of the IC could be modified more readily than could the structure of the firm (organicity). Thus, the assumption is that the impact of IC formalization on satisfaction will vary over the range of organicity. The values for the regression equation are:

$$b_1 \quad = \quad -1.232705*$$
$$b_2 \quad = \quad .067759** \qquad * = \quad \text{Signify} \quad .0001$$
$$b_3 \quad = \quad .268671* \qquad ** = \quad \text{Signify} = .0005$$
$$a \quad = \quad 4.255159$$

The interpretation of this significant interaction is a two step procedure. First, it must be determined if the modified relationship is monotonic or nonmonotonic. This depends upon the relative value of the coefficients for the interaction and additive terms. The equation $Y = b_2X_2 = b_3X_1X_2$ may be rewritten as a partial derivative, where $dY/dX_1 = b_1 + b_3X_2$.

This equation indicates that the effect of X_1 on Y is a function of X_2 and the values of b_1 and b_3. The point where the effect of X_1 on Y is zero, or where $dY/dX_1 = b_1 + b_3X_2 = 0$ is also where X_2, the modifying variable is equal to the ration of the coefficients of the additive and interaction terms: $X_2 = -b_1/b_3$. This is the point on the range of X_2 at which X_1 has no effect on the dependent variable Y. That is to say, it is the point of inflection of the partial relation dY/dX_1. If the value for X_2 obtained from this equation falls within the observed range within the sample, this is the point at which the effect of X_1 on Y will change signs. As a consequence, the effect will be nonmonotonic: negative over a portion of the observed range of X_2, and positive over the remainder of its range. Substituting the values from this study into the equation one gets: $X_2 = -(1.232705)/268671$ or $X_2 = 4.588$.

Since this value is within the range of 2.29 to 6.14, which was the observed range for this study, one can state that the effect of X_1 on Y is nonmonotonic. That is, the point at which the effect of X_1 on Y changes does fall within the range of observations. Thus, Hypothesis 1a is supported. Hypotheses 1b and 1c are substantiated by the following:

H_{1b}: When organicity is low (mechanistic), increases in IC formalization will positively influence user satisfaction.

H_{1c}: When organicity is high (organic), increases in IC formalization will negatively influence user satisfaction.

If one were to plot the relationship between formalization and satisfaction for only those firms which were indicated to

be mechanistic, one would see that the slope of the best fit curve (line) has a positive value, 0.70610. Similarly, a plot of the same relationship but for the organic firms shows a line with a slope of -1.05833. The differences are fairly obvious. These data support hypotheses 1b and 1c. (The plots are not reproduced here in interest of space saving.)

The second hypothesis is based upon the work of Alexander and Randolph (1985). They found their measure of fit (in the contingency model context) between structure and technology was a better predictor of performance than any of their independent measures. Thus, in the nature of a replication study, it is hypothesized that:

H_2: The measure of the fit between the level of formalization in the IC and the organicity of the total organization will be a better predictor of IC satisfaction than either of those measures independently.

Alexander and Randolph used a difference score between their independent variables as a measure of fit. In this study that measure of fit is the difference between the Z-score of the organicity scale and the Z-score of the IC formalization scale for each organization. Table 3 shows the results of the regression procedure.

This regression model tested the relationships of IC cluded formality and Organicity with Satisfaction and then included the difference score in the model. Significant results were formality and Organicity with Satisfaction and

Table 3 Results of Regression Using Difference Score Unstandardized Coefficients

Independent Variables	Step 1	Step 2
IC Formalization	.205035	.188419
T =	1.946	1.995
Significance of T	.0568	.0511
Organicity	.256393	.111278
T =	3.783	1.093
Significance of T	.0183	.2793
Difference Score	.456553	
T =	3.789	
Significance of T	.0004	
R^2	.13588	.32004
T =	4.24579	8.31524
Significance of T	.0194	.0001

then included the difference score in the model. Significant results were obtained in the first step ($R2 = .13588$, $F = 4.24579$, $p < .019$). However, including the difference score in the analysis provides a much better model. With the three independent variables in the model the results are:

$R^2 = .32004$, $F = 8.31524$, $p < .0001$.

For the difference score, $T = 3.789$, with a significance level of .0004, compared with significance levels of .0511 for IC formalization and .2793 for organicity. These data support Hypothesis 2. Hypothesis 2 is accepted.

In summary, the principal contingency hypotheses have been supported by the data and Hypothesis 2, concerning use of a difference score was also accepted based upon the data.

DISCUSSION OF RESULTS

The primary thrust of this research was to establish a contingency model of Information Center management, generate hypotheses based upon that model, and to collect data to test those hypotheses. That portion of this research has been a resounding success. The data which were gathered from a national random sampling of ICs strongly support the contingency model.

This research provides the basis for stating that the relationship between IC formalization and user satisfaction is substantially moderated by the organicity of the total organization. That the new contingency model has been supported in this research means that a whole new array of information is available to researchers and practitioners in the IC arena. That variables from the field of organization theory have been found to be meaningfully related to the variable, user satisfaction, from the MIS field is exciting. The identification of relevant variables is an important aspect of the research process. The identification of relationships among variables is yet another aspect of that process. Progress has been made in both of those areas by this research. This makes available to IC researchers the wealth of information which exists in the literature concerning organicity and organizational formalization.

There was also very strong support found in this study for the usefulness of difference scores as put forth by Alexander and Randolph. As was the case in their study, of the three predictor variables, organicity, formalization, and the difference between those two, the difference score was the most influential in accounting for the variance in the dependent variable, satisfaction. Also, including the difference score in the regression equation resulted in a doubling of the R^2 value, the proportion of variation explained by the equation, from .14 to .32.

Overall, what is significant in this research is that the

contingency model developed was supported by the data. That the data were from a representative sample of the total population sets the stage for extending the findings of this research to that population as a whole. Theoreticians can appreciate that a new inter-disciplinary model has been created, tested and proven. Practitioners will be pleased to discover that the findings from this research can have direct and immediate applicability in their environment.

IMPLICATIONS FOR FUTURE RESEARCH

This research project generated new knowledge for both researchers and for practitioners. The identification of the interaction among organizational variables should suggest to researchers fertile fields for continuing research. One such area would be the linking other structural or organizational variables to IC satisfaction.

This study parsimoniously selected formalization as the structural construct. A more robust extension of this research would be to determine whether or not the moderating impact of organicity on the relationship between formalization and satisfaction also hold for centralization and complexity, the other major constructs of structure? In this study it was shown that "success" for these Information Centres was contingent upon a fit between organizational variables. The IC is one kind of group providing support services. Would these finding hold for other kinds of service providing groups?

Research issues related to this study, but somewhat more tangential, are that the satisfaction data in this study had an interesting pattern. In the two fit cells, with the higher satisfaction values, there was not a significant difference between the values. However, there were differences among the all of other cells, including between the two mismatch cells. High satisfaction was found in two different environments, both organic and mechanistic organizations had high satisfaction levels, and both also had low values. The high values were not different from each other; the low satisfaction values were different. Does this suggest that satisfaction is not a single, simple construct? That is, is high satisfaction merely an extension of low satisfaction? Herzberg developed his two factor theory of motivation around the concept that satisfaction in the workplace is not a single factor, but two different ones - his hygiene factors and his satisfiers. It would certainly be interesting to investigate the phenomena of user satisfaction from that perspective and to see if there exist two (or more) dimensions to that construct as well.

IMPLICATIONS FOR MANAGERIAL ACTION

This research has provided a caution flag for those in the IC profession who are arguing for more control (formalization)

in the management of these groups. Many contingency theories today point out the necessity of making an analysis of situational variables before attempting to apply any theoretical prescription. That is, moving towards the control stage may not be appropriate, and in fact can be harmful in organic organizations, but on the other hand, in mechanistic organizations, that may well be the course to follow.

By matching the style of managing an Information Center to the overall organicity of the organization, the manager can expect to have more satisfied users. As was discussed earlier in this paper, because of the nature of the services provided by Information Centres, satisfied users tend to be productive users. In this era of national and international competitive pressures, that can be a genuine contribution.

For Information Centre managers, this research provides them with the knowledge of which style of IC management would be most appropriate for their company, given an assessment of the organicity of the firm, which should lead to better management and utilization of resources by them.

The seven items which made up the organicity scale can be used by IC managers to very quickly make that assessment, and then to evaluate their own IC management practices to see if their practices are congruent with the overall structure of the firm. This research has provided clear evidence that higher satisfaction depends upon that congruence.

Finally, this research studied companies as they existed and took as a given the overall structure of the firm. As consideration is given to modifying the structure of the IC to align it with the organicity of the firm, consideration must also be given the question of whether or not that structure is appropriate. The perspective of this research was intra-organizational, i.e., analysing the impact upon satisfaction of a fit or lack of fit between the structural variables. There is a substantial body of literature dealing with the extra-organizational issues, whether or not the structure of the firm is appropriate for its external environment. And a last parting thought, it would be quite interesting to do a study of user satisfaction comparing in-house service providers with those service providers which have been "outsourced."

REFERENCES

1. Aladwani, Adel M., "Organizational Actions, Computer Attitudes, and End User Satisfaction in Public Organizations:" Journal of End User Computing, Vol. 14, Issue 1, Jan-Mar 2002.

2. Alavi, M., "End-User Computing: The MIS Managers' Perspective", Information and Management, Vol. 8, 1985, pp. 171-178.

3. Alavi, M., Phillips, J.S. and Freedman, S.M., "An Empirical Investigation of Two Alternative Approaches to Control of End-User Application Development Process," Data Base, Vol. 20, No. 4, 1990.

4. Arnold, H.J., "Moderator Variables: A Clarification of Conceptual, Analytic, and Psychiatric Issues", Organizational Behavior and Human Performance, Vol. 29, 1982, pp. 143-171.

5. Alexander, Judith W. and Randolph, W. Alan, "The Fit Between Technology and Structure as a Predictor of Performance in Nursing Subunits", Academy of Management Journal, Vol. 28, No. 4, 1985, pp. 844-859.

6. Au. Norman, Ngai, Eric, W.T. Cheng and T./C. Edwin, "A Critical review of End User Information System Satisfaction research and a New Research Framework", Omega (Oxford), Vol. 30, Issue 6, Dec 2002.

7. Benjamin, Robert I., and Scott Morton, Michael S., "Information Technology, Integration, and Organizational Change", Interfaces, Vol. 18, No. 3, May-June 1988, pp. 86-98.

8. Benson, D.H., "A Field Study of End User Computing: Findings and Issues", MIS Quarterly, Vol. 7, No. 4, December 1983, pp. 35-46.

9. Bergeron, Francois, and Berube, Carole, "The Management of the End-User Environment: An Empirical Investigation", Information and Management, Vol. 14, 1988, pp. 107-113.

10. Bergeron, F., Rivard, D. and DeSerre, L., "Investigating the Support Role of the Information Center," MIS Quarterly, Vol. 14, No. 3, 1990.

11. Blackburn, Richard and Cummings, Larry L., "Cognitions of Work Unit Structure", Academy of Management Journal, Vol. 25, No. 4, 1987, pp. 836-854.

12. Brancheau, James C. and Brown, Carol V., "The Management of End-User Computing: Status and Directions," ACM Computing Surveys, Vol. 25, No. 4, December 1993.

13. Burns, T., and Stalker, G.M., The Management of Innovation, London: Tavistock Publications, 1961. Cale, Edward G., and Curley, Kathleen Foley, "Measuring Implementation Outcome: Beyond Success and Failure", Information and Management, Vol. 13, 1987, pp. 245-253.

14. Carr, H.H., "Information Centers: The IBM Model vs. Practice", MIS Quarterly, Vol. 11, No. 3, September 1987.

15. Carr, H.H., Young, D., Rainer, R. K., Jr., "MIS's Role in Determining Information Center Services," Journal of Information Systems Management, Spring 1990, pp. 33-40.

16. Christy, David P., and White, Clinton E., "Structure and Function of Information Centers: Case Studies of Six Organizations", Information and Management, Vol. 13, 1987, pp. 71-76.

17. Conrath, D.W. and Mignen, O.P., "What is Being Done to Measure User Satisfaction with EDP/MIS?" Information and Management, Vol. 19, 1990, pp. 7-19.

18. Coppola, August, "Through the Computer Darkly," Academic Computing, Vol. 2, No. 1, September 1987.

19. Covin, Jeffrey G., and Slevin, Dennis P., "The Influence of Organization Structure on the Utility of an Entrepreneurial Top Management Style", Journal of Management Studies, Vol. 25, No. 3, May 1988.

20. CRWTH Computer Coursewares, Inc., First Annual Information Center Survey, Los Angeles, CA, 1986.

21. Desai, Mayur S. And Richards, Thomas, "End User Training: A Meta Model", Journal of Instructional Psychology, Vol. 26, Issue 2, June 1999.

22. Etezadi-Amoli, Jamshid and Farhoomand, "A Structural Model of End User Computing Satisfaction and User Performance", Information and Management, Vol. 30, No. 2, May, 1996.

23. Ford, Jeffrey D., "Institutional Versus Questionnaire Measures of Organizational Structure: A Re-examination", Academy of Management Journal, Vol. 22, No. 3, 1979. pp. 601-610.

24. Fredrickson, J.W., "The Strategic Decision Process and Organization Structure," Academy of Management Review, Vol. 11, 1986, pp. 280-297.

25. Fry, Louis W. and Slocum, John W., Jr., "Technology, Structure, and Workgroup Effectiveness: A Test of a Contingency Model", Academy of Management Journal, Vol. 27, No. 2, 1984, pp. 221-246.

26. Galletta, Dennis F., and Lederer, Albert N., "Some Cautions on the Measurement of User Information Satisfaction", Decision Sciences, Spring, 1989.

27. Glisson, Charles A., and Martin, Patricia Yancey, "Productivity and Efficiency in Human Service Organizations as Related to Structure, Size, and Age", Academy of Management Journal, Vol. 23, No. 1, 1980, pp. 21-37.

28. Govindarajulu, Chittibabu, "The Status of Help Desk Support", Communications of the ACM, Vol. 45, Issue 1, Jan 2002.

29. Greenberg, Eric Rolfe, "How Far, How Fast?", Information Center, Vol. IV, No. 8, August 1988.

30. Guimares, T., and Ramanujam, V., "Personal Computing Trends and Problems: An Empirical Study", MIS Quarterly, Vol. 10, No. 2, June 1986, pp. 179-185.

31. Hackman, J. Richard, and Suttle, J. Lloyd, "Improving Life at Work: Behavioral Science Approaches to Organizational Change", Santa Monica, CA; Goodyear Publishing Co., 1977.

32. Hage, J., and Aiken, M., "Relationship of Centralization to Other Structural Properties," Administrative Science Quarterly, Vol. 12, 1967, pp. 77-92.

33. Hall, R., "Interorganizational Structural Variation: Application of the Bureaucratic Model", Administrative Science Quarterly, Vol. 7, 1962, pp. 295-308.

34. Hammond, L.W., "Management Considerations for an Information Center", IBM Systems Journal, Vol. 21, No. 2, 1984, pp. 131-161.

35. Hinnings, C.R., and Lee, G.L., "Dimensions of Organization Structure and Their Context: A Replication", Sociology, Vol. 5, 1971, pp. 83-93.

36. Hitt, Michael A. and Middlemast, R. Dennis, "A Methodology to Develop the Criteria Weightings for Assessing Subunit Effectiveness in Organizations", Academy of Management Journal, Vol. 22, No. 2, 1979, pp. 356-374.

37. House, R.J., and Rizzo, J.R., "Toward the Measurement of Organizational Practices: Scale Development and Validation", Journal of Applied Psychology, Vol. 56, 1972.

38. HTTP://WWW.osf.org/comm/lit/dce-eup/argonne.html.

39. IBM, The Management of End User Computing: Executive Direction: White Plains, NY, 1984A.

40. IBM, The Management of End User Computing: Executive Direction: White Plains, NY, 1984C.

41. Igbaria, M. and Nachman, S.A., "Correlates of User Satisfaction with End-User Computing", Information and Management, Vol. 19, 1990.

42. Igbaria, Magid and Zviran, Moshe, "Comparison of End-User Computing Characteristics in the U.S., Israel and Taiwan", Information and Management, Vol. 30, No. 1, January 1996.

43. Igbaria, Magid, Zinatelli, Nancy, Cragg, Paul and Cavaye, Angele L.M., "Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model", MIS Quarterly, Vol. 21, No. 3, September 1997.

44. Jelinek, Mariann, Litterer, Joseph A., and Miles, Raymond E., Eds., Organizations by Design: Theory and Practice, 2nd Ed., Plano, TX: Business Publications, Inc., 1986.

45. Johnson, Sabrina Jo-Handgen and Raymond, Mary Jane, "Controlling End User Computing", Management Accounting (USA), Vol. 76, No. 3, September, 1994.

46. Kotter, J., Organizational Dynamics: Diagnosis and Intervention, Reading, MA: Addison-Wesley, 1978.

47. Khosrowpour, Mehdi, Effective Utilization and Management of Emerging Information Technologies, Hershey, PA., Idea Group Publishing, 1998.

48. Ledbetter, William N., Snyder, Charles A., and Cox, James F., "Assessing the Organizational Climate for OA Implementation", Information and Management, Vol. 8, 1985, pp. 155-170.

49. Lederer, A.L., Stubler, W.F., Sethi, V., and Ryan, J.C., "The Implementation of Office Automation", Interfaces, Vol. 17, No. 4, July-August, 1987.

50. Lee, Denis M.S., "Usage Pattern and Sources of Assistance for Personal Computer Users," MIS Quarterly, Vol. 10, No.4, December 1986, pp. 313-325.

51. Leitheiser, Robert L., and Wetherbe, James C., "Avoiding the Pitfalls of End-User Computing", MISRC-WP-85-09, Working Paper Series, MIS Research Center, University of Minnesota, Minneapolis, MN, 1984, pp. 1 23.

52. Magal, Simha R., and Carr, Houston H., "An Investigation of the Effects of Age, Size, and Hardware Option on the Critical Success Factors

Applicable to Information Centers", Journal of Management Information Systems, Vol. 4, No. 4, Spring 1988, pp. 60-76.

53. *Marco, HTTP://www.marconet.com/training/training.htm.*

54. *McHaney, Roger, Hightower, Ross and Pearson, John, "A Validation of the End User Computing Satisfaction Instrument in Taiwan", Information & Management, Vol. 39, Issue 6, May 2002.*

55. *Merlyn, Vaughan, "MIS, Info Centers Close the Breach", Computerworld, Vol. 21, No. 40A, October 7, 1987.*

56. *Moore, G.C. and Benbast, I., "Development of an Instrument to Measure Perceptions of Adopting Information Innovation", Information Systems Research, Vol. 2, No. 3, 1991.*

57. *Morris, James H., Steers, Richard M., and Koch, James L., "Influence of Organization Structure on Role Conflict and Ambiguity for Three Occupational Groupings", Academy of Management Journal, Vol. 22, No. 1, 1979, pp. 58-71.*

58. *NORCONS, HTTP://www.norexonline.com/norcons_personal.html.*

59. *Organ, D.W., and Greene, C.N., "The Effects of Formalization on Professional Involvement: A Compensatory Process Approach", Administrative Science Quarterly, Vol. 26, 1981, pp. 237-252.*

60. *Parasuraman, Saroj, Greenhaus, Jeffrey H., Rabinowitz, Samuel, Bedeian, Arthur G., and Mossholder, Kevin W., "Work and Family Variables as Mediators of the relationship Between Wives' Employment and Husbands' Well-Being", Academy of Management Journal, Vol. 32, No. 1, 1989, pp. 185-201.*

61. *Pava, Calvin, Managing New Office Technology: An Organizational Strategy, New York: The Free Press, 1983*

62. *Porter, Lyman W., and Lawler, Edward E., Managerial Attitudes and Performance, Homewood IL: R.D. Irwin & Co., 1968.*

63. *Proceedings of ACM, HTTP://www1.acm.org:81/sigchi/chi97/proceedings/sig.hg.htm.*

64. *Pugh, D.S., Hickson, D.J., Hinnings, C.R., and Turner, C., "Dimensions of Organization Structure", Administrative Science Quarterly, Vol. 13, 1868, pp. 65-105.*

65. *Pui, Lai To, The Support Role of Information Centers, International Journal of Management, Vol. 19, Issue 2, June 2002.*

66. *Rivard, Suzanne, "Successful Implementation of End-User Computing", Interfaces, Vol. 17, No. 3, May-June 1987, pp. 25-33.*

67. *Sathe, Vijay, "Institutional Versus Questionnaire Measures of Organizational Structure", Academy of Management Journal, Vol. 21, No. 2, 1978, pp. 227-238.*

68. *Schoonhoven, Claudia Bird, "Problems with Contingency Theory: Testing Assumptions Hidden within the Language of Contingency Theory", Administrative Science Quarterly, Vol. 26, 1981.*

69. *Shaw, Nancy, Joo-Eng Lee and Ang, James S.K., "Understanding the Hidden Dissatisfaction of Users Toward End User Computing", Journal of End User Computing, Vol. 15, Issue 2, April-Jun 2003.*

70. *Shayo, Conradand Guthrie, Ruth, "Exploring the Measurement of End User Computing Success", Journal of End User Computing, Vol. 11, Issue 1, Jan-Mar 1999.*

71. *Smith, Amy E., "A Concept Come of Age", Business Computer Systems, November 1983.*

72. *Snitkin, Sydney R., and King, William R., "Determinants of the Effectiveness of Personal Decision Support Systems", Information and Management, Vol. 10, 1986, pp. 83-89.*

73. *Speier, C., and Brown, C.V., "Differences in End-User Computing support and Control Across User Departments", Information and Management, Vol. 32, No. 1, February 1997.*

74. *Stevens, L., "Every User A Programmer", Computer Decisions, Vol. 18, August 26, 1987.*

75. *Tan, Boon Wan and Lo, Tak Wah, "Validation of a User Satisfaction Instrument for Office Automation Success", Information and Management, Vol. 18, 1990, pp. 203-208.*

76. *Thorn, R.G., Guynes, J.L., Guynes, S., "Strategic and Operational Issues for the Successful Information Center", Journal of Information Systems Management, Spring 1990, pp. 15-22.*

77. *Van de Ven, A.H., and Delbecq, A.L., "A Task Contingent Model of Work Unit Structure", Administrative Science Quarterly, Vol. 19, 1974, pp. 183-197.*

78. *Venkatraman, N., "The concept of Fit in Strategy Research: Toward Verbal and Statistical Correspondence", Academy of Management Review, Vol. 14, No. 3, 1989.*

79. *Vijayaraman, B.S. and Ramakrishna, H.V., "A Comparative Analysis of Successful and Unsuccessful Information Centers", Information and Management, Vol. 19, 1990.*

80. *Wang, Charles B., "The Unholy Marriage of Business and Technology: Does Yours Need Counselling?", CMA - The Management Accounting Magazine, Vol. 69, No. 9, November, 1995.*

81. *Winter, Susan J., Chudoba, Katherine M. and Gutek, Barbara A., "Misplaced Resources? Factors Associated with Computer Literacy Among End Users", Information and Management, Vol. 32, No. 2, February 15, 1997.*

82. *Woodward, J., Management and Technology, London: Her Magesty's Stationery Office, 1965.*

83. *Yowell, C.O., Info Center Administration, IBM Technical Report G320-6614, June 1981.*

84. *Zviran, Moshe, "Relationships Between Organizational and Information System Objectives: Some Empirical Evidence", Journal of Management Information Systems, Summer, 1990, Vol. 17, No. 1, pp. 65-84.*