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Assimilating Innovative Technology: A More Comprehensive Model

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ABSTRACT

This paper proposes a comprehensive approach for dealing with assimilation of innovative technology. The need for structural adaptation of the organization in support of activities to manage adoption and implementation is modeled by both associative and causal explanatory models. Assimilation success is studied as both a social and a technical construct. Results include: (1) success as absenteeism rate and goal attainment exhibits significant associative models; (2) successful resistance management, successful transition management and structural adaptation for transition appear most frequently as significant constructs explaining assimilation success in its various forms; (3) the two-stage causal model model cannot be either accepted or rejected; (4) the need for better measurement models for several of the constructs is indicated; and (5) factors commonly associated with organizational innovativeness have seemingly little explanatory power of assimilation success. Proposals are made for future research efforts designed to yield more conclusive results.

INTRODUCTION

The introduction of innovative technology such as a new information system or office automation equipment into the workplace presents many problems even to the largest and most affluent organizations. The problems arising from trying to assimilate new technology at the organizational level have led to a great deal of research into two major aspects of this process: the factors which aid or impede technology adoption (e.g., Rogers, 1962; Rogers and Shoemaker, 1971; Baldridge and Burnham, 1975; Downs and Mohr, 1976; Bigoness and Perreault, 1981), and the implementation process itself (e.g., Ginzberg, 1978, 1979, 1980, 1981a, 1981b; Zand and Sorensen, 1976; Zmud and Cox, 1979). One recent study (Zmud, 1982) has attempted to involve organizational structural factors in the implemention process, but without fully adaptive characteristics. What appears to be missing, however, is an overall approach treating technology introduction factors, the implementation process, and possible complementary organization structure changes as components of the same framework. The goal of this study is to assess the possible impact of these constructs on assimilation success,

where assimilation is treated as an overall process of introduction and implementation.

Implementation management can be further decomposed into three constructs: successful management o& resistance, successful management of transition, successful political power management (Nadler, 1981). Structural adaptation to complement adoption and transition will be modeled as two separate constructs. Specifically, the significance of the individual impacts of each of these factors must be assessed as well as their joint impact. In the next section the proposed constructs will be defined and then the two models of assimilation success can be developed.

Construct Definitions

Organizational innovation capability is the aility to recognize and support the adoption of beneficial innovative technology. The extent of this capability has been shown to be related to the "levels" of various factors at the environmental, organizational, individual levels (e.g., Rogers, 1961; Rogers and Shoemaker, 1971; Baldridge and Burnham, 1975), but recent work by Kimberly and Evanisko (1981) has shown that environmental factors such as the degree of competition may have only minimal impact on innovation capability. Individual and organizational-level factors will be considered as defining innovation capability in this approach.

The assimilation group leader's education, job tenure, management experience, and technical experience are suggested as individual-level factors by previous work (Cyert and March, 1963; Becker, 1970; Rogers and Shoemaker, 1971; Daft, 1978; and Kimberly and Evanisko, 1981).

Organizational level factors of organizational size and number of departments (functional differentiation) are suggested by previous work (Hage and Aiken, 1967; Baldridge and Burnham, 1975; Moch, 1976; and Kimberly and Evanisko, 1981).

The implementation management constructs of successful management of resistance, successful management of transition, and political power management success are taken from Nadler's (1981) work on comping with organizational change. These constructs are intended as planned organizational responses to planned change (such as technology assimilation) so that the "fit" or equilibrium of the underlying organizational components may be maintained. Successful management of resistance is defined as managerial activity to: (1) identify and highlight dissatisfaction with the current state, (2) build employee participation into the change, (3) reward desired behavior, and (4) provide ample time and opportunity for change (Vroom, 1964; Kotter and Schlesinger, 1977; Nadler, 1981). Successful management of the transition is defined as managerial activity to: (1) provide a clear image of the future, (2) maintain multiple and consistent leverage points by matching people and jobs, (3) provide transition arrangements (manager, ample resources, transition plan, and structure), and (4) provide feedback mechanisms (Nadler, 1981). Political power management success is defined as managerial activity to: (1) insure power group support, (2) provide strong leadership, (3) provide recognition of the technology implementation group, and (4) maintain some stability within the organization (Nadler, 1981).

These constructs were developed by Nadler to complement an underlying model of organizational behavior: Nadler and Tushman's (1977) congruence model. This model enhances earlier open systems work (e.g., Leavitt, 1965; Lawrence and Lorsch, 1969; Gal-

braith, 1977) and supports this three construct equilibrium maintenance approach to implementation management, which is somewhat like the Lewin-Schein (Lewin, 1952; Schein, 1961) model of organizational change.

Two constructs are proposed in the area of complementary organizational structure changes: structural adaptation for adoption and structural adaptation for transistion. Zaltman and Duncan (1977) have proposed these constructs as a means of enhancing the success of managerial activity for initiating and then implementing planned organizational change. The managerial activities proposed for these two constructs operationalize beliefs by organizational theorists that no one best way exists to structure an organization for all possible tasks (e.g., Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Zand, 1974). These constructs are defined in terms of three structural factors: complexity (number of occupational specialities and professionalism of those heading up these areas), formalization (organizational reliance on specific rules and procedures), and centralization (extent to which the locus of decision making is dispersed).

Specifically, Zaltman and Duncan define structural adaptation for adoption as activity to maintain high complexity and low formalization and centralization. This implies a diverse representation, broad guidelines, and some autonomy in decision making (Sapolsky, 1967; Duncan, 1972). Structural adaptation for transition requires managerial activity to obtain low complexity and high formalization and centralization. This implies activity to mold a diverse group into a single unit, development of more formalized procedures such as planning, progress reports, etc., and a reduction in the locus of decision making authority (Wilson, 1966: Radnor and Neal, 1973; Hage and Dewar, 1974).

Assimilation success is treated in both social (organizational) and technical contexts in this paper. Specifically, social success is defined here as employee committment to organizational goals and, alternately, as job satisfaction (Cox, et al., 1981).

Technical assimilation success is defined as the technology functioning as envisioned, with the anticipated level of use, with a minimum of redesign required, and helping meet expected goals (Lucas, 1978; Robey, 1979; Edstrom, 1977; and Cox et al, 1981).

THEORETICAL FRAMEWORK

Model Development

The research themes mentioned previously all attack at least one part of the problem of assimilating technology, but only a cumulative effect seems likely to explain success in such projects. The organization must be able to reconize the need for innovative technology, must be able to manage the assimilation process and must recognize the need to dynamically change its structure as required. If any one action is deficient, then suboptimal results are likely.

With the preceeding ideas in mind it is simple to visualize the associative model shown in Figure 1. It is proposed that the joint impact of the six constructs significantly explains technology assimilation success. Also the claim is made tht each of these constructs has a positive effect on assimilation success. This model is assumed to hold no matter how assimilation success is defined, either in a social or technical context. Only the main effects of the six constructs are considered, given the preliminary nature of this study and the limited sample intended.

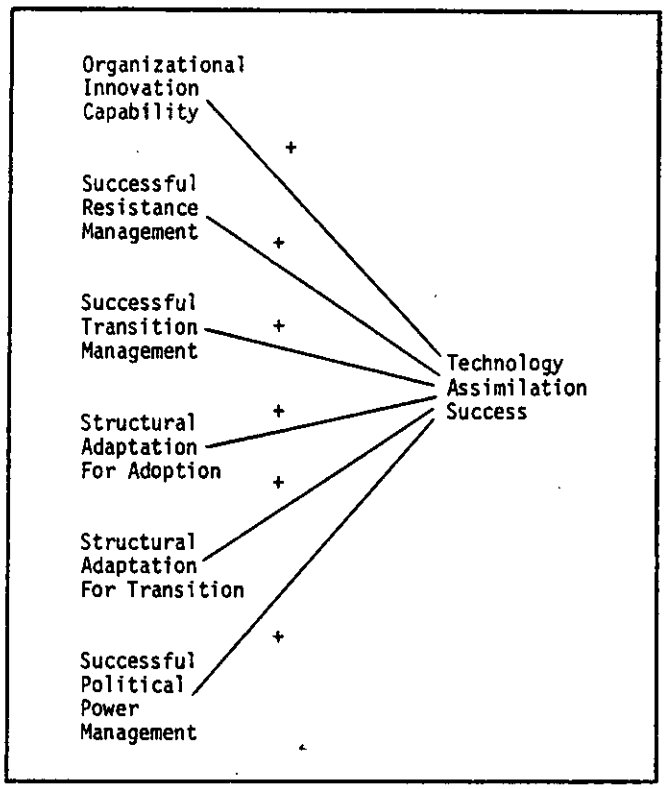

Figure 1. Explanatory Model of Technology Assimilation Success

A close examination of the proposals (and claims) made by Nadler (1981) and Zaltman and Duncan (1977) leads to another model of assimilation success. It is Nadler's claim that managerial activity, delineated by the three implementation management constructs, will enhance assimilation success. Zaltman and Duncan claim that structural adaptation will enhance the success of the activities designed to overcome resistance and to manage the transition. Figure 2 shows a causal model that would seem to satisfy the implied claims of causation and meet the usual causation requirements of time dependence and relationship significance (e.g., Kenny, 1979). Links identified by an "L" prefix are presumed to be causal links and those links with a "C" prefix are assumed to represent only simple associations between constructs.

In all cases the association (causal or simple association) between constructs is positive. This follows directly from the proposals by Zaltman and Duncan, Nadler (1981) and the various innovation diffusion authors.

Now the hypotheses necessary to test these premises may be introduced.

Hypotheses Tested

A good associative model should provide components whose joint effects will account for a significant proportion of the dependent variable's variation. The model shown in Figure 1 proposes six constructs that should jointly provide significant explanatory power for assimilation success.

Hypothesis 1: Organizational success in assimilating innovative technology is significantly as-

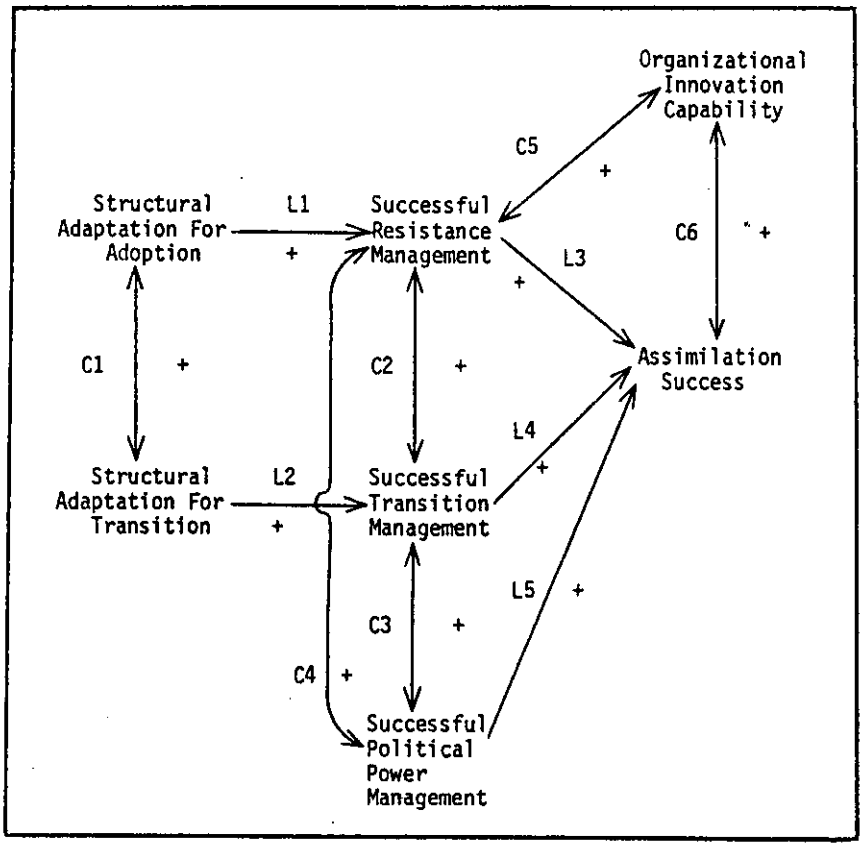

Figure 2. Causal Model of Technology Assimilation Success

sociated with the joint effect of: resistance, transition, and political power management success; structural adaption for adoption and transition; and organizational innovation capability.

Hypothesis 1 is to be tested for each of the eight measures of assimilation success outlined previously to evaluate the relative exploratory power of the model.

It is also important to identify those individual constructs that make a significant contribution by themselves, apart from their joint effect.

Hypothesis 2: Each independent construct of the associative model, when taken individually, has a significant impact on organizational success in assimilating innovative technology.

In each case this impact will be tested for each of the eight definitions of technology assimilation success.

The causal model shown in Figure 2 can be tested on an overall basis if enough sample data (in terms of observations per parameter to be estimated) is available. Due to the small sample each link had to be tested separately, resulting in two general hypotheses. The five causal links (indicated by the links L1-L5 in Figure 2) are tested, and in each case it is hypothesized that a positive causal impact occurs.

Hypothesis 3: Each of the causal links (L1-L5) found in the causal model of technology assimilation success are both significant and denote a positive impact.

The second hypothesis involving the causal model deals with the nature of the correlation links of the model. These links are assumed to denote significant positive correlation between model constructs.

Hypothesis 4: Each of the correlation links (C1-C6) found in the causal model of echnology assimilation are both significant and positive in direction.

The associative model (see Figure 1) was defined with each of the independent constructs having a positive impact upon assimilation success. The positive association of these constructs assumed in Figure 1 can be tested as follows.

Hypothesis 5: Each independent construct of the associative model has a positive association (correlation) with technology assimilation success; with success defined as either a social or a technical construct.

In the next section the measures necessary to operationalize the model constructs are discussed.

MEASURES UTILIZED

For measures not prominently found in the literature the question was asked: How can one measure the content implied by the construct's definition? This rough guide proposed by Hage (1972) helped in content validation of these measures.

For those measures requiring small scales each was analyzed for internal reliability before the scale value was used in testing the models. A minimum value of 0.70 for Cronbach's coefficient alpha was used as a cutoff value (Nunnally, 1978).

Independent Measures

Most of the measures are derived directly from the construct definitions. Several, however, require further clarification.

The percentage of department heads belonging to professional organizations is used as a measure of complexity for the structural adaptation during adoption construct.

The extent of openness among implementation team members is measured to determine the degree of complexity for the transition structural adaptation construct; perhaps obtained via team building activity (Crockett, 1970; McGill, 1977). The singleness of purpose measure captures an aspect of increased formalization, as felt and exhibited by team members (See Gross, et al., 1971).

The resistance management success construct measures require some additional explanation. Both an explicit (status quo unacceptable announcement) and an implicit (use of performance data) measure are used to gauge management's effort to bring out dissatisfaction with the current state. Measures of both active (percentage of representation and highest level of users on team) and passive (degree of representation and amount of input) participation are used to measure employee involvement.

Transition management success involves communicating information about the change taking place. Items measuring both the amount and the quality of this communication are utilized. Matching people and tasks within the organization helps to insure a change that is lasting and in the desired di-

rection (Nadler and Tichy, 198). Previous work (Hackman and Oldham, 1976; David and Taylor, 1975; and Davis, 1982) motivated an eight item quality of working life scale, and an item is used to determine if some system modification had been made in an effort to accommodate the employees. An eight item planning adequacy scale was developed from previous reviews (Lindsay and Rue, 1980; Anthony and Eardon, 1980; and Radford, 1980).

Management's use of symbols is an important aspect of political power management success. One item is used to estimate the amount of recognition provided to the assimilation management team, and another item is used to estimate the permanent organizational level of this team.

Dependent Measures

Measures for technical success follow from the construct definitions, but the social success measures requirement clarification.

The absenteeism rate is used to measure job satisfaction as well as organizational commitment (e.g., Steers and Rhodes, 1978; Cheloha and Farr, 1980, keeping in mind that at least one study did not find a significant relationship between absenteeism and commitment (Angle and Perry, 1981). The voluntary turnover rate is used to measure commitment to organizational values (e.g., Porter et al., 1974; Angle and Perry, 1981). The change in absenteeism and turnover rates are also determined in an attempt to measure change in commitment after the technology implementation was completed.

Although rough, the measures utilized here were deemed adequate for this preliminary study. The intent here is to adhere to the spirit of the constructs implied by the three search themes and to operationalize these constructs accordingly.

A brief review of the methodology is now in order to set the stage for considering the study results.

METHODOLOGY

Sample Utilized

A previous (1979) study of planning for office automation yielded a potential pool of approximately 310 Fortune 1000 firms having completed or expected to complete implementation of office automation technology during the subsequent two years.

Office automation was chosen as the target technology because of the current interest exhibited by many firms. It was hoped that this strong vested interest would overcome the natural hesitancy to complete the lengthy questionnaire being used. A usable response of 53 firms (17%) indicates only partial success in this area.

Hypothesis Evaluation

The overall explanatory power of the associative model (Hypothesis 1) was tested by evaluating the full regression model for a significant overall F-value and adjusted R-square value and the significance of the contribution of each of the individual constructs in explaining the variability of assimilation success was evaluated by testing the squared semipartial correlation coefficient for significance.

The significance of the causal and correlation links of the causal model (see Figure 2) were tested using the LISREL V program (Joreskog and Sorbom, 1981). LISREL V treats the overall causal model as two models in one: a structural model of relationships between latent constructs and a meas-

urement model of the loadings of the latent constructs on their respective indicator variables, with both sets of parameters estimated simultaneously.

The associative model is hypothesized to have positive associations between assimilation success and the six independent constructs. This assertion was checked by evaluating each link of the model (Figure 2) separately (again, because of the small sample size) using LISREL V.

Given this brief discussion of the research methodology employed, the results may now be reviewed.

RESULTS

Association Model Explanatory Power

Table 1 shows the results for testing the joint impact of the associative model constructs upon assimilation success.

Hypothesis 1 is supported when assimilation success is defined as absenteeism and goal success, which seems to indicate explanatory power of employee support for the organizations' goals. The adjusted R-square figures indicate a significant proportion of success variability explained.

The significance of each independent construct's explanatory power was evaluated under Hypothesis 2. The results are shown in Table 2. Note that transition management success and structural adaptation for transition are significant for both absenteeism and goal success definitions of assimilation success.

When considering the two significant colums (success as absenteeism and goal success), transition management success, structural adaptation for transition, and political power management success are significant for the former, while all constructs except successful political power man-

Table 1. Overall Explanatory Model Results

DEPENDENT VARIABLE	F-VALUE	PROBABILITY	ADJUSTED R-SQUARE
Turnover	1.165	0.3938	0.108
Absenteeism	2.191	0.0578	0.465
Turnover Change	0.479	0.9637	0.000
Absenteeism Change	1.108	0.4370	0.073
Actual Use of Technology	0.993	0.5334	0.002
Technical Capacity Used	1.262	0.3288	0.161
Percentage Design Changed	0.907	0.6133	0.001
Goal Success	3.012	0.0149	0.595

Table 2. Significance (F-Ratio) of Independent Constructs Associated With Assimilation Success

HYPOTH. NUMBER	INDEPENDENT CONSTRUCT	ASSIMILATION SUCCESS MEASURE							
		TURNOVER	ABSENTEEISM	TURNOVER CHANGE	ABSENTEEISM CHANGE	ACTUAL USE	TECHNOLOGY USED	DESIGN CHANGE	GOAL SUCCESS
2.1	Organizational Innovation Capability	1.084	1.400	0.693	0.396	0.448	1.426	0.721	4.346**
2.2	Successful Resistance Management	0.687	1.868	0.669	2.313*	0.845	0.929	0.684	3.025**
2.3	Successful Transition Management	0.565	2.749**	0.366	0.994	1.019	0.917	0.606	2.182*
2.4	Structural Adaptation For Adoption	0.463	1.766	0.363	0.031	0.266	0.944	0.854	2.992*
2.5	Structural Adaptation For Transition	0.937	2.802*	0.746	0.277	0.846	2.010	0.887	4.476**
2.6	Successful Political Power Management	1.332	2.787*	0.828	1.179	0.319	1.843	1.130	2.112
		*p<.10	**p<.05	***p<.01	****p<.001				

agement are significant for goal success.

Both the overall significance and the individual construct significance of the associative model are at a maximum for success defined in terms of goal attainment. The ease in assembling the data and the relative accuracy of interpreting the data request may play an important part in the significance of this result.

Before evaluating the results of the causal model link tests (Hypotheses 3 and 4), the adequacy of the measurement model must be assessed. Remember that LISREL does a joint estimation of the structural and measurement model parameters on an iterative basis. If the measurement model is very inappropriate then the iterative process will distort the structural equation loadings accordingly.

From Table 3 it is apparent that the structural adaptation for adoption construct shows no significant loadings, and the successful transition management and successful political power management constructs both show heavy loadings for a few significant variables, but the nearly uniform standard error terms cast a shadow on the credibility of these estimates.

The measurement of assimilation success involved two general catagories: social and technical success. Considering the measures used, the results are somewhat puzzling. Technical success should load positively on both goal success and technical capability utilized. Social success should load negatively on both turnover and absenteeism rates. The "split" signs of the technical success loadings and the "reversed" signs of the social success

Table 3. Measurement Model Results

CONSTRUCT/VARIABLE	LOADING	STD. ERROR	T-VALUE
Adaptation For Adoption			
Professionalism	0.387	0.294	1.316
Diversity	0.410	0.312	1.312
Broad Guidelines	0.361	0.273	1.319
Autonomy	-4.998	88.651	-0.056
Adaptation For Transition			
Single Purpose	0.521	0.184	2.839***
Openness	0.721	0.212	3.404***
Centralized Decision	0.452	0.176	2.565**
Innovation Factors			
Education	-0.002	0.090	-0.020
Job Tenure	-0.272	0.159	-1.709*
Management Experience	-1.414	0.546	-2.595**
Technical Experience	-0.269	0.158	-1.701*
Organization Size	-0.272	0.159	-1.710*
No. of Departments	0.131	0.112	1.162
Adoption Activities			
Dissatisfaction Data	0.514	0.155	3.309***
Status Quo Unacceptable	0.560	0.154	3.640****
Percent User Represent.	0.365	0.159	2.285**
Input From All Areas	-0.044	0.164	-0.268
Highest User Org. Level	0.527	0.155	3.406***
No. of Groups Represented	0.487	0.156	3.123***
End User Representation	0.461	0.156	2.939***
Desired Behavior Rewards	0.514	0.155	3.314***
Time For Adaptation	0.330	0.160	2.058**
Transition Activities			
User Communication Qual.	0.958	0.168	5.684****
User Communication Amount	0.744	0.158	4.724****
Quality of Work Life Score	0.048	0.144	0.334
Technical Modification Pct.	-0.252	0.144	-1.745*
Leader Organizatioal Level	0.065	0.144	0.449
Pct. Resources Allocated	0.074	0.144	0.514
Resource Adequacy	0.148	0.144	1.026
Planning Score	-0.054	0.144	-0.375
Feedback Score	0.143	0.144	0.995
User Feedback Frequency	0.075	0.144	0.520
Mgmt. Feedback Frequency	-0.176	0.143	-1.217
Political Power Management			
Power Group Support	0.732	0.136	5.369****
Mgmt. as Role Models	0.741	0.136	5.435****
Recognition Provided	0.156	0.154	1.009
Group's Permanent Level	0.236	0.153	1.543
Stability For Some Areas	0.139	0.155	0.901
Technical Success			
Actual Use	0.144	0.134	1.075
Technical Capability Used	-0.452	0.247	-1.824*
Goal Success	-0.159	0.136	-1.165
Percentage Design Changed	-0.416	0.226	-1.840*
Social Success			
Turnover Rate	0.958	0.363	2.643**
Absenteeism Rate	0.652	0.267	2.443**
Turnover Rate Change	0.015	0.144	0.102
Absenteeism Rate Change	-0.142	0.151	-0.946

*p<.10 **p<.05 ***p<.01 ****p<.001

loadings are some indication of the instability of the iteration process or of the basic inconsistency of the data. It is possible that questionnaire item misinterpretation occurred, or that a better construct definition is required.

The five causal links specified in Figure 2 were tested under the general Hypothesis 3. The five working hypotheses were tested with the results in the first eight rows of Table 4. Only the link from successful transition management to social success is significant at the 0.05 level, although the link from successful transition management to technical success is significant at the 0.10 level. Hypothesis 3 is upheld in both instances since increases in social success result in lower turnover and absenteeism rates, and the expected positive loading between transition management success and technical success exists.

The goodness of fit indicators show a reasonable fit for the other causal links, but none of these have significant loadings. Most of the other links show some loading, but not at any significant level.

The test results of the simple correlation links are tested under Hypothesis 4. Only the correlation link between successful resistance management success and successful political power management is significantly positive, and in this case the associated probability of having a higher Chi-square value given the same degrees of freedom is zero (although the Chi-square value degrees of freedom ratio and the QPLOT slope indicate some promise of fit). Hypothesis 4 must be rejected.

Table 4. Causal Model Link Analysis Results

HYPOTH.	MODEL LINK	CHI-SQUARE	DEGREES FREEDOM	PROB.	LOADING	T-VALUE	QPLOT SLOPE
3.1	L1	27.15	20	0.131	-0.042	-0.033	1.489
3.2	L2	36.20	27	0.111	0.267	1.583	1.438
3.3	L3(Social)	104.29	65	0.001	0.253	1.585	1.261
3.3	L3(Tech.)	89.25	65	0.025	-0.203	-1.245	1.474
3.4	L4(Social)	49.05	35	0.058	-0.353	-2.375**	1.612
3.4	L4(Tech.)	59.09	35	0.007	0.295	1.982*	1.795
3.5	L5(Social)	30.60	27	0.288	0.031	0.051	1.229
3.5	L5(Tech.)	35.46	27	0.128	-0.169	-1.133	1.341
4.1	C1	2.23	8	0.973	-0.229	-0.977	12.758
4.2	C2	71.26	43	0.004	-0.521	-3.579****	1.401
4.3	C3	18.76	19	0.473	-0.037	-0.176	1.932
4.4	C4	125.14	76	0.000	0.862	8.538****	1.451
4.5	C5	122.14	89	0.011	-0.017	-0.093	1.229
4.6	C6(Social)	34.27	34	0.455	0.114	0.990	1.570
4.6	C6(Tech.)	32.92	34	0.521	0.004	0.049	1.489

*p<.10 **p<.05 ***p<.01 ****p<.001

The correlation links between structural adaptation for adoption and structural adaptation for transition, and between successful management of transition and successful management of resistance are both negative, with the former link being very significant. This result coupled with the significant causal link between successful transition management and assimilation success would seem to indicate either relative unimportance of the adoption phase or a complete clouding of the results by the measurement problems.

Direction of Associative Model Impact

The test of a positive construct-level impact on success proposed under Hypothesis 5 is reported in Table 5. Successful transition management was significant for both technical and social success, and in the desired direction. Hypothesis 5 is rejected for all other independent constructs, although structural adaptation for transition shows some promise for significance and direction.

A more complete interpretation of these results is in order, along with some indication of where continued research might lead.

CONCLUSIONS

Interpretation of Results

The association model of Figure 1 has been shown to possess significant explanatory power for assimilation success when success is defined as either employee support for organization goals (absenteeism rate) or as organ-

Table 5. Correlation of Independent Constructs With Assimilation Success

INDEPENDENT CONSTRUCT	SUCCESS MEASURE	CHI-SQUARE	DEGREES FREEDOM	PROB.	CORRELATION COEFFICIENT	T-VALUE	QPLOT SLOPE
Organizational Innovation Capability	Tech.	32.92	34	0.521	0.004	0.049	1.489
	Social	34.27	34	0.455	0.114	0.990	1.570
Successful Resistance Management	Tech.	88.85	64	0.022	-0.164	-0.684	1.489
	Social	104.07	64	0.001	0.198	1.037	1.389
Successful Transition Management	Tech.	148.04	89	0.010	0.975	3.786***	1.350
	Social	147.78	89	0.010	-0.423	-2.912***	1.543
Structural Adaptation For Adoption	Tech.	16.28	19	0.639	-0.032	-0.036	1.748
	Social	23.69	19	0.208	-0.052	-0.274	1.656
Structural Adaptation For Transition	Tech.	14.76	13	0.323	0.912	1.433	2.277
	Social	11.93	13	0.533	0.136	0.689	3.787
Successful Political Power Management	Tech.	28.31	26	0.343	-0.475	-1.828*	2.065
	Social	30.59	26	0.244	0.031	0.053	1.207

*$p < .10$ **$p < .05$ ***$p < .01$ ****$p < .001$

izational goal attainment success. In addition each of the independent constructs of this model has shown significant individual impact on assimilation success defined as some form of technical or social success. In particular, the structural adaptation for transition and the successful transition management constructs are both significant when the overall model is significant. This last result indicates the importance of handling this phase of assimilation very thoughtfully.

The verification of a positive association between the independent constructs and assimilation success was only partially verified. Successful transition management does meet the criteria for both catagories and is seen as important, but no other construct meets the criteria. A possible single-source bias or the obvious deficiencies of many of the measurement submodels will account for this failure. The insignificance of the organization innovation capability construct is open to question, but the most obvious cause is the homogeneity of the sample.

The results obtained for the causal model are difficult to interpret in light of the obvious measurement problems. The variables proposed for the constructs may be inappropriate or the measures used for these variables could be faulty, or the data collected imprecisely. The general causal model structure proposed seems plausible enough, but the data does not confirm this premise. Considering the very small sample size and the inherent instability of the T-values used to determine significance of the loadings, it seems unfair to reject the causal structure outright. A "no result" verdict is more appropriate.

Some consideration of March's (1981) concept of a solution driven change must be made. The theory proposed by March is that the manager selects the best technical solution available (for any problem) and goes through the list of problems looking for the best match. This matching problem is difficult and mismatches are bound to occur. The mismatch becomes a less successful assimilation. The results obtained do seem to indicate the possibility of technology availability driving the selection/adoption process and management asserting itself during the implementation/transition phase.

Future Research Directions

Future work in this area should be centered around several issues: reassessment of the construct structure, evaluation of the variables used to operationalize the constructs, provision for collection of longitudinal data, provision for field collection of data, and enlarging the data collection to insure adequate sample size for the methodological techniques envisioned.

The construct structure should be reassessed not only as to the inclusion of the present constructs, but also as to the possible decomposition into more homogeneous sub-constructs.

The variables used to operationalize the constructs were taken directly from the construct definitions, when possible. It would seem prudent to carefully consider these variables and see if substitution and/or elimination might be in order. Subsequent work (data dredging) has shown that a reconstituted causal model is significant, but the construct definitions are lacking. The goal was to evaluate the proposals as constructed by Nadler and Zaltman and Duncan. Further research need not be hindered by this limitation.

Some attempt could also be made at purification of the final measures used to describe each construct. Sta-

tistical techniques such as factor analysis may be employed if enough sample data exists to insure satisfactory performance. If the measurement issues are settled before the causal structure is evaluated, the results will be much cleaner.

Historical data use poses limitations that a longitudinal study could eliminate. Improved accuracy and equivalent data definitions are potential benefits, and field data collection will further enhance these benefits.

The need for a relatively large sample cannot be overestimated. The use of a causal modeling program like LISREL requires 5-10 observations per parameter being estimated. In order to test the full causal model proposed in this paper a sample of from 250 to 400 firms would be required, if the measurement issues have been resolved.

Management Implications

The results obtained in this study indicate the importance of the transition phase and the potential gains to be realized if the management team allows some structural changes to occur dynamically. More importantly, perhaps, is the indication that further success may be obtained if more attention is paid to the initial contact stage as well.

It is evident that enhanced employee commitment to the firm is significantly associated with a more comprehensive approach to bringing new technology on board. Managers must learn to look more closely at the adoption phase as well as the implementation phase. One implication is the allowance of more direct end user initial involvement. Also direct managerial participation seems required; not just budgetary allowances.

Whether discussing a new information system, a DSS, or powerful work stations, the approach used in assimilating the technology should be wholistic and planned, and not just a reaction to new technological developments.

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