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ELECTRONIC INTEGRATION AND STRATEGIC ADVANTAGE: A QUASI-EXPERIMENTAL STUDY IN THE INSURANCE INDUSTRY

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ABSTRACT

Strategic advantage through information technology is a popular theme, but the extent of research support is sporadic, minimal, and unsystematic. This paper reports some preliminary results of a quasi-experimental study on the role of dedicated electronic integration (between an insurance carrier and its independent agents in the Property and Casualty market) in providing strategic benefits to this carrier. The results indicate that the agents that are electronically interfaced with the carrier report improvements in a set of four performance factors in the expected direction (six months after system installation) but statistically different from a matched set of non-interfaced agents (based on size, state, and location category) only in terms of increases in efficiency (number of policies) but not in terms of effectiveness (increase in financial performance indices). Further, within the sample of electronically-interfaced agents, over a one-year period after integration, the differential performance positions continue for this factor, raising the possibility of learning effects. Some explanations, extensions and research implications are outlined.

1. INTRODUCTION

The subject of information technology and its potential for strategic advantage has gained currency in recent years. The evolving literature is largely dominated by conceptual frameworks (McFarlan 1984; Porter and Millar 1985; Wiseman 1985) and detailed case studies on popular examples and applications such as McKesson's *Economost* system (Clemons and Row 1988), American Airlines' SABRE reservation systems (Copeland and McKenney 1988) or American Hospital Supply's ASAP system (Harvard Business School Case 1985, 1988). A major reason for the consideration of IT-based applications as potential sources of strategic advantage lies in the capability for *electronic integration* among a set of firms that could potentially change the basis of competition in an industry (Barrett and Konsynski 1982; Cash and Konsynski 1984; Johnston and Vitale 1988). The term "electronic integration: as used here involves the creation of a business network among selected firms that centrally exploit the capabilities offered by interorganizational (information) systems (IOS).

While the role and benefits of interorganizational systems have achieved the status of conventional wisdom, the extent of research support for arguing their importance is rather limited. The current literature is restricted to discussions of the nature and *levels* of IOS (Barrett and Konsynski 1982), *descriptive* and *normative* frameworks for managers to assess the role of IOS in their organizational contexts (Cash and Konsynski 1984; Johnston and Vitale 1988) and theoretical discussions of the role of IOS in changing market characteristics (Bakos 1987; Malone, Yates and Benjamin 1987). There is a glaring lack of empirical research studies that particularly isolate the effects, if any, of such systems on business performance. Indeed, much of the support is based on anecdotes, personal opinions and experiences rather than systematic research studies. Thus, a formal, empirical assessment of the role and benefits of electronic integration appears necessary and timely.

Towards this end, this paper discusses the results of a quasi-experimental study on the effects of electronic integration in the insurance industry, with a particular focus on the Property and Casualty (P&C) business. The uniqueness of this study lies in

(a) its quasi-experimental design with an *experimental* sample of independent insurance agents that are electronically interfaced (with a dedicated system) and a *matched, control* sample (based on size, state, location category) of agents that are not electronically interfaced with this particular insurance carrier; and

(b) the use of *objective*, longitudinal performance data on these agents from the carrier's records that enables one to isolate the specific effects of electronic integration.

Thus, the study offers an opportunity to systematically test an implicitly-accepted, but largely-untested proposition on the benefits of electronic integration. The paper is divided into four sections. The next section discusses the theoreti-

cal background for the study, and the particular characteristics of the P&C market, leading to the formulation of the research hypothesis. The third section discusses the research design, data and analysis. The fourth section presents the results and discusses the implications.

2. BACKGROUND: THEORETICAL CONCEPTS AND RESEARCH SETTING

2.1 Electronic Integration and Strategic Advantage

In this research stream, terms like IOS, EDI (electronic data interchange), and VAP (value-added partnerships) have often been used synonymously. Our view of "electronic integration" involves (a) arrangements and transactions in a business network that is fundamentally enabled by electronic interfacing, i.e., multi-organization information systems, and (b) firms in the business network that are independent along some dimensions (i.e., they are not entirely dependent) such that it is distinguished from vertical, quasi-integration (Blois 1972). In other words, electronic integration refers to strategies adopted by the different firms in a business network (Jarillo 1988) that is centrally defined using one or more electronic interfaces. Thus, this conceptualization builds on the deployment of IOS but has a distinct business orientation; similarly, electronic integration goes beyond the adoption of EDI standards for computer-to-computer communication. Further, our view of IT-enabled strategic advantage relates to the "advantage that accrues to the focal organization using a specific IT-application that *cannot* be obtained through other mechanisms."

Assessment of Evidence. As noted earlier, the extent of support for the benefits of electronic integration is sparse. The American Hospital Supply Corporation's (AHSC, now Baxter Travenol) *ASAP System* is a classic, overworked illustration in this area. Although no systematic assessment of its effects is available, by 1984 over 4,500 customers were linked through this system which carried over 100,000 products. Further, AHSC increased its sales by an average of thirteen percent per year during the period 1978 to 1983. A typical hospital order through this system averaged 5.8 items as compared to an industry average of 1.7 items (*Business Week* 1980). Baxter executives and industry observers credit the system for the success of the company in the competitive hospital supplies marketplace. In contrast, Clemons and Row (1988) provide a more detailed analysis of McKesson's *Economost* system. According to them, since the system was first introduced nationally in 1975, McKesson's drug sales have grown from $922 million to $4.8 billion, an increase of 422 percent, while its operating expenses have only gone up by 86 percent; McKesson also sizably reduced the number of personnel in order entry and sales. Similarly, *airlines reservation systems* have been studied in detail (e.g., Copeland and McKenney 1988). Although exact data are not available, it is widely acknowledged that the proportion of tickets booked through the *SABRE* system was much higher for American Airlines' flights than for any other airline whose schedules were also displayed on the system.

While there appears to be strong face validity to the results reported in these case studies, from a research point of view they need to be supplemented using more formal criteria of social science research. For this purpose, we use the following set of six criteria provided by Terpstra (1981) in his assessment of research studies on organization development effects: the presence of a probability sample, an adequate sample size for analysis, the use of a control group, random selection for treatment, pre- and post-tests, and the use of significance levels for assessing the effects of treatment. For a systematic evaluation of electronic integration effects, these criteria need to be satisfied.

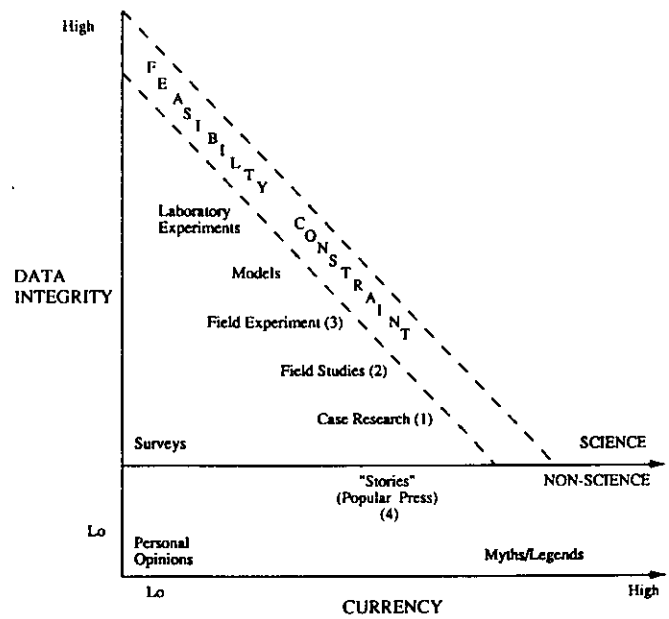


Figure 1. Strategic Effects of Electronic Integration An Assessment of Research Efforts (based on Bonoma [1985])

Further, following Bonoma (1985), we position the literature on the effects of electronic integration in terms of two dimensions: *currency* (external validity) and *data integrity* (reliability) in Figure 1. A major observation from Figure 1 is that much of the available evidence is based on anecdotes (discussions in the popular business press), personal opinions, and a few selected detailed case-studies. This preponderance of case studies is not only inevitable in the initial stages of a particular research stream, but is also necessary for framing the critical research questions. However, as the stream matures, it is

necessary to go beyond these designs for formalized, deductive assessments of propositions on the role and benefits of electronic integration. Specifically, field experiments and field studies (Figure 1) seem worthwhile and attractive now.

This study is explicitly predicated on the need to design and conduct a field experiment on the effects of electronic integration and incorporates five of the six criteria of Terpstra (1981) into its design.

2.2 The Property and Casualty Insurance Market

The US insurance industry divides broadly into the Life and Health and the Property and Casualty (P&C) markets, each with its distinctive set of products and channels of distribution. P&C insurance offers protection against such risks as fire, theft, accident and general liability. The P&C market further breaks out into personal and commercial lines, the former covering individuals (automobile and homeowner insurance for example) and the latter indemnifying business policy holders against general liability and workers' compensation. The industry generated about $200 billion in premiums in 1988 (based on Standard and Poor industry surveys).

The P&C insurance market, particularly its commercial lines, relies mainly on independent agents for distribution of its products to the customer, unlike the Life and Health Companies which typically employ large sales forces. Independent agents are compensated on commission terms and they retain the rights to their policies and accounts, even if their relationship with the insurance carrier issuing the policy is terminated. Thus, the independent agent is entitled to continue receiving commissions on unexpired policies, although the agent may sell the renewal rights on the policy (Stern and El-Ansary 1977).

The P&C market is composed of over 3,600 insurance carriers since there are few barriers to entry. This level of fragmentation makes for highly competitive conditions and intense price-based competition. Approximately 300 carriers have multiple offices (Frost and Sullivan 1984) and 20 to 30 are major carriers accounting for about 50 percent of revenues. The largest carrier accounted for about nine percent in 1986 and the top four controlled only 21 percent, indicating relatively low market power in the industry.

Further, we are seeing a major transformation of the industry in recent years along several dimensions. One, there has been a reduction in the number of independent agents by as much as 25 percent during the period 1980 to 1986 (d'Adolf 1987, p. 27.) to around 42,000 due to the consolidation of agency operations. Two, there is a growing trend in forward integration by carriers through mechanisms such as direct-writing, commissioned employee systems, and exclusive agencies. Third, there is an increasing incidence of the installation of agency automation systems ("back-office" automation), which require larger business volumes with the resulting scale economies to be efficient. Finally, electronic integration between insurance carriers and independent agents is another force that has been changing the competitive characteristics of the marketplace. A recent survey estimated that 28 percent of all independent agents were integrated with at least one insurance carrier (d'Adolf 1987, p. 28).

Within the P&C market, personal lines are characterized by increasing vertical integration because of their relatively standardized and regulated products. Insurance products of personal lines have been prime targets of large insurance carriers for obtaining efficiencies from high volume processing as evidenced by a high degree of computerization in their operations. In contrast, commercial lines are less regulated, more complex, and thus are being automated in terms of computerized policy processing only recently. It is not coincidental that expert systems, which have seen a surge of development of late, are beginning to have an integral role in the automation of commercial lines. This study focuses on the specific effects of automation of the commercial lines.

2.3 The Nature of Electronic Integration

Industry standards for electronic policy information transfer between the carrier and insurance agents have been set by the industry organization, ACORD. In 1983, the Insurance Value Added Networks (IVANS) was established. While the agents seem favorably disposed to the use of a common standard, some carriers are less enthusiastic about adopting a common standard as they believe that a "true interface" between the agent and all the relevant carriers would make the market more price-competitive than before. This is because the transaction cost of accessing and evaluating alternate quotes is dramatically reduced, thereby improving the market positions of the agents relative to the carriers. Indeed, in in the terminology of Malone, Yates and Benjamin (1987), such a move would have propelled the industry from a decentralized marketplace towards an electronic market due to significant reductions in the "unit costs of coordination" of the delivery of the insurance product.

To counter the move towards common, industry-wide standards, some leading insurance carriers (such as Aetna, CIGNA, Travellers, St. Paul) have chosen to install systems with proprietary interface standards operated through private networks. This initiative stalls (albeit in a limited way) the movement towards predominantly price-based competition, which might result from agents using a common network to "instantaneously shop around" for the best price (as enabled, for example, by the airline reservation system).

This research is focused exclusively at the level of one carrier that has installed such a system with its agents (who may or may not be electronically interfaced with other carriers).

Electronic Integration and the Carrier's Business Strategy. Electronic integration with the agents is considered by this carrier to be a central element in its business strategy. The carrier's business strategy in the P&C market can be broadly described in terms of (a) reducing the number of agents to concentrate on a limited number of high-potential agents (with significant share-of-business with this carrier); (b) controlling loss ratios (which are highly related to the share-of-business of the agent, i.e., the largest share carrier has the best loss-ratios); and (c) creating product differentiation (through higher service levels).

This business strategy is supported by electronic integration by way of the installation of a commercial policy processing system at selected independent agents. The specific characteristics of the system are:

(a) *On-line policy quotation*, which enables the agent to obtain relevant information on a potential quote with relative ease and quickness compared to the traditional means of paper-based communication with the carrier (typically between one and two weeks). More importantly, the ease of information exchange implies that this carrier would at least be under active consideration for channeling the business.

(b) *Multiple option flexibility*, which enables the agent to explore alternative bundles of specifications at the decentralized location on-line.

(c) *Risk evaluation*, which provides an efficient basis for evaluating the risk propensity of a prospective policy with the capability offered by the back-end expert systems.

(d) *Policy issuance*, which allows agents to initiate the process of issuing a policy at remote carrier locations, thereby increasing agents' control and reducing paper-handling.

(e) *Endorsements*, which allow greater autonomy and responsibility for post-issuance support (including minor modifications).

(f) *Claims handling*, which automates the steps involved in settling claims, resulting in improved efficiency and greater level of service.

An additional feature of this specific deployment is that the system is installed at no cost to the agents as the carrier bears the entire expense of hardware, software, communications and associated training.

2.4 The Expected Benefits of Electronic Integration

The Underlying Theory. Following Malone, Yates and Benjamin (1987), developments in information technologies are expected to give rise to three sets of effects: (a) *electronic communication effect*, reducing costs of communication while expanding the reach (time and distance); (b) *electronic brokerage effect*, increasing the number and quality of considerations of alternatives, and decreasing the cost of transactions; and (c) *electronic integration effects*, increasing the degree of interdependence between the set of participants involved in the insurance delivery process. Had the insurance industry adopted a common platform for integration (as in the current state of airlines reservation systems), it would have presumably resulted in all three effects being operative leading to an electronic marketplace. However, such is not the case here. This situation is one of a small group of carriers -- mainly the larger ones -- each with its own network of agents (with the larger agents having multiple interfacing capabilities) expecting to realize benefits from dedicated vertical information systems.

An additional argument is provided by Rotemberg and Saloner (1989) in their discussion of cooperative advantage versus competitive advantage through information technology networks. The former arises when a firm goes along with a common standard instead of pushing its own proprietary standard. However, if a firm can successfully differentiate its network, then the competitive advantage gained from such a network may be greater than the cooperative advantage of standardization. Thus, this is a central business strategy decision for the insurance carrier and, in the present setting, the carrier has decided to go with a dedicated system.

Thus, following Malone, Yates and Benjamin (1987), Rotemberg and Saloner (1989), and Williamson (1975), our theory would predict that each carrier that deploys a network characterized by limited access (with the associated benefits of electronic communication and integration for the connected agents) would benefit significantly in terms of greater business volume and increased market share. This is because the classical forces favoring commoditization of the insurance product (in the electronic markets) are countered by IT-enabled differentiation mechanisms operating within electronic hierarchies. The specific characteristic of electronic hierarchies here is provided by the existence of linked databases and processes (underwriting and the role of expert systems) between the agents and the carriers.

Two Levels of Analysis. In the case of electronic integration involving two distinct types of organizations, namely the carrier (i.e., the deployer of the system) and the agent (i.e., where the system is deployed), it is important to differentiate the type and extent of strategic advantages to the two organizations. At the level of the agent, the

specific benefits are as outlined above. Specifically, given that the agent is not required to share the system costs, the benefits are directly provided by any increases in efficiency and an improved capability to service existing and potential clients. These issues, including the costs to the system and captivity impacts, are beyond the scope of the current paper, which specifically focuses on the benefits accrued to the carrier.

For the carrier, who deployed the dedicated system and bore its costs and given the relative increase in the "ease of doing business," the expectation is that more business would be channelized to this carrier than before. Specifically, if we argue that commercial insurance products are becoming commodities with strong price-competition and fewer opportunities for true product differentiation, it appears that "information" (enhanced through specific electronic interfacing) is a major dimension of differentiation. Information-based differentiation is important for the personal lines products because they are largely information-intensive, but commercial lines products have an additional dimension of differentiability since they are more knowledge-intensive.

There are interesting parallels with other cases. For example, the ASAP system has reportedly channelized more business to American Hospital Supply due to ease of system use as well as its capability to assist in a variety of business transactions such as order-status, tracking, and so on. Similarly, as American Airlines received a greater proportion of business based on the "display bias" on the screen, the expectation is that the focal, interfaced carrier would always be considered as a potential underwriter of a particular business (as long as it offers the product line).

Further, there is the expectation of increased business volume from the agents resulting from an expansion of *their* volume of operations. The efficiencies in information processing through electronic integration would ensure that the agent could service a larger account base than before. The assumption here is that the differential information processing capabilities (such as timeliness, accuracy, efficiency, and expert-system support) are critical differentiators of the commercial insurance product. Thus, the agent's capability -- to quote, issue, and underwrite policies specifically tailored to the customer requirements and differentially from the competitors who are not electronically interfaced -- is considerably enhanced.

Assessment of Effects of Electronic Integration. As noted before, this paper is focused at the level of the insurance carrier. The approaches to assessment of effectiveness is a thorny issue in organizational research (Cameron and Whetten 1983), including IS research, which uses several different constructs (e.g., Trice and Treacy 1989). There are two dominant approaches to the assessment of expected benefits for the carrier.

(a) *Cost Versus Benefit Approach*, requiring a direct economic assessment of all costs associated with this initiative compared directly against actual realized benefits along a set of pre-specified performance criteria.

(b) *Benchmarking Approach*, requiring an assessment of performance improvements for the interfaced agents against a matched sample of agents that are not interfaced.

The *cost-benefit* approach is complex for the following reasons.

a. The costs were incurred over a period of several years over successive iterations of the system rendering a direct cost versus benefit comparison somewhat difficult.

b. Given the carrier's strategy of adopting a proprietary system to create sources of firm-specific competitive advantage, some of the benefits are not directly measurable in terms of short-term improvements in performance.

c. The system is conceived by the firm as a strategic thrust involving several business lines over many years, thus making any precise cost allocation for a given set of business nearly impossible.

d. A direct cost versus benefit assessment does not rule out the possibility that agents could substitute other business factors, for example better service and lower prices, to compensate for the lack of system functionalities such as instant information on policies.

In contrast, the *benchmarking* approach has the following benefits.

a. It controls for the temporal context of industry cycles given that both sets of agents are facing the same external conditions.

b. It isolates the specific IT-based gains by using a matched sample.

c. It avoids arbitrariness in cost allocation and focuses on effects relative to a benchmarked sample.

Therefore, the effects are assessed from a goal-centered perspective (Cameron and Whetten 1983) in terms of the specific set of benefits expected by the focal carrier. This set of expected benefits was created based on discussions with the company executives and it includes increases in total written premium, number of policies in force, commissions, and new business policies. Collectively, these represent the effectiveness construct for this study.

2.5 Hypothesis

The general hypothesis for the study is stated in a null form (with an alternate form).

H_0: Electronic integration will have no effect on the performance of the interfaced agents as compared with the non-interfaced agents;

H_{alt}: Electronic integration will have a positive effect on the performance of the agents that are electronically interfaced as compared to those that are not interfaced.

3. RESEARCH DESIGN

3.1 Design of Quasi-Experiment

As mentioned above, the research design involved a quasi-experimental study of the performance effects of electronic integration in the commercial lines of the P&C market with a particular focus on the electronic integration by one major carrier. The essential characteristics of the design involved five steps.

I. Identification of a random sample of agents that are electronically-interfaced with the carrier (termed here as the "experimental" group).

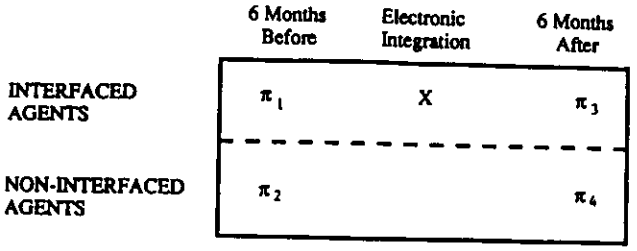
II. Identification of a "matched set" of non-interfaced agents who are matched using three critical criteria: size (in terms of premium volume), location category (metro, small city, suburban versus rural), and geographic category (state or region). In other words, a corresponding agent in the same size category, in the same state, and in the same location category was selected.

III. Identification of the date of electronic integration. This was the later of the two dates on which the two most significant commercial lines of business were electronically interfaced, as identified by the carrier for each agent.

IV. Selection of a "performance effects window" six months prior to interfacing and six months[1] after interfacing.

V. Analysis of the performance effects of integration.

The quasi-experimental design adopted for the research needs some discussion. As shown in Figure 2, the design adopted is the *untreated control group design with pretest and posttest* (Cook and Campbell 1979). This is different from the pure experimental design version in which the experimental subjects are assigned randomly from a common population. We did not have the opportunity to influence the selection of agents to be interfaced; however, we were fortunate to obtain a reasonable, matched control group. This design controls for a major set of threats to validity.



X - Electronic Integration("treatment")

π_i - Performance Assessment at t_i , i=1,4

$$H_{alt}: \quad \frac{\pi_3 - \pi_1}{\pi_1} > \frac{\pi_4 - \pi_2}{\pi_2}$$

$$H_0: \quad \frac{\pi_3 - \pi_1}{\pi_1} = \frac{\pi_4 - \pi_2}{\pi_2}$$

Figure 2. The Design of the Quasi-Experimental Study

The integration with the agents began in 1985 and is still continuing. For this research, in order to control for possible temporal effects (particularly sensitive in the insurance industry which is susceptible to volatile cycles), the sample was restricted to those integrated in one calendar year. Given our need for an adequate sample size for statistical analysis, we chose the year that recorded the largest integrations, which was 1987. The sample size for the two groups are interfaced group (i.e., treatment), n = 85, and non-interfaced, n = 75.[2]

3.2 Data

Data on the four performance indicators were obtained from the internal records of the insurance carrier. For each agent, the performance levels were obtained for six months prior to integration and for six months after the integration. Given that all the data are obtained from the internal records, there are no compelling reasons to expect differential measurement systems for the two groups (one of the common threats to validity in this type of design). The measurement error, if any, is common to the two groups of agents.

Performance attributable to integration is assessed as the slope (in terms of differences) rather than as absolute levels. This is because the inherent differences in the performance levels before integration are corrected by focusing on the changes in performance. Discussions with the managers of the carrier indicated that no other major

confounding factors exist differentially across the two groups. Thus, if performance differences are found for the electronically-interfaced group in comparison to the control group, they can be attributed with confidence to electronic integration.

The performance differences across the two groups are assessed using t-tests. Since the data on percentage changes in performance appeared not to conform to standard normal distributions, data on percentage changes in performance were rescaled using a natural log transformation. The values for skewness and kurtosis, which far exceeded the normal range in the original scale, now exhibited values within an acceptable range for normal distribution.

4. RESULTS AND DISCUSSIONS

Table 1 summarizes the results of the analysis. Three important patterns emerge from this table. The interfaced group had consistently better performance levels *before* integration (along all of the four criteria) than the non-interfaced group (all the t-values are significant at $p<.01$). This is largely attributed to the fact that the carrier obviously selected its better-performing agents for electronic integration and thus a true experimental design would not have been possible. This further reinforces the need to assess percentage changes in the two groups rather than absolute differences.

The interfaced group continued to report consistently better performance levels *after* integration (along all of the four criteria) than the non-interfaced group (all the t-values are significant at levels better than $p<.01$). Thus, a posttest-only design would have been of limited value.

The third pattern, however, is particularly striking. The *differences* in performance levels are generally *not* statistically different from the non-interfaced (control) group. Indeed, only two of the t-values are significant, albeit marginally, at $p<.10$ and both relate to *efficiency* -- namely, increase in the number of policies. Both measures of financial performance, written premium and commissions, did not differ between the two groups.

4.1 The Question of Learning Effects

At this stage, there exists an obvious question of learning effects: Is it possible that the performance improvements were not observed within a six-month period after integration due to the internal process transformation that may be necessary to fully exploit the capabilities offered by integration? Adequate prior support exists for arguing that the effects of technology are not instantaneous and that organizations need to transform their internal processes to fully exploit IT capabilities (Rockart and Short 1989).

Accordingly, we evaluated the performance changes (percent) over a period of one year after integration. There was a significant percentage increase in the number of policies issued among the interfaced group compared with the non-interfaced group (t-value: 2.04, $p<.05$). It is important to recognize that while there is some possibility of confounding effects due to a one-year window, these are mitigated by the fact that the results are compared against a benchmarked sample of matched agents in the same time-period. So, in contrast to a posttest only design (even with a matched sample), the confounding effects are considerably minimized. However, along the dimensions of total premium and commissions, there were no differences.

Thus, we speculate at this stage on the existence and impact of learning effects in exploiting electronic integration opportunities and capabilities. This is because of the effort required in shifting an organization deeply rooted in one type of business process towards one that involves radical shifts in the processes. Since we have not explored nor measured this issue in any detail to conclude organizational learning effects, we note it as an interesting and important issue worthy of further research attention and we are exploring longitudinal designs with complementary primary data from the agents on their process changes.

4.2 Synthesis

The aim of this study was to assess the collective performance of a set of agents that are electronically interfaced against a corresponding group that is not interfaced electronically with a focal carrier. The results provide modest support for performance increase along some dimensions (e.g., new business policies for the six-month window), but the overall performance effects are not very strong. Further, while new policies are an important element of the insurance business, it is equally important to focus on the *quality* of the insurance sold by these agents. For this purpose, it is critical to also assess performance of loss-ratios, especially in those cases where electronic integration also involved the decentralization of underwriting authority to the agents. This requires a complementary, focused analysis at the level of the agent (which is being carried out).

4.3 Research Implications

The major implication is that there is a critical need to systematically study the theoretical propositions on the role and effects of electronic integration that have been recently offered (Malone, Yates and Benjamin 1987; Rotemberg and Saloner 1989). Towards this end, this study has made a modest attempt in designing and executing a field experiment. We believe that this is valuable for addressing the research questions in this area. However, researchers should examine other designs (presented in Figure 1) to

Table 1. Performance Effects of Electronic Integration
Monthly Averages ($000)
(over six month period)

Performance Indicator	Interface (n=85) Mean	Sd	Non-Interface (n=75) Mean	Sd	T-Test Difference
Total Written Premium (Before)	166.5	255.2	74.5	59.8	3.25***
Total Written Premium (After)	201.2	411.8	70.2	68.4	2.99***
Change (%) in Total Premium 1	26.9	75.0	105.7	456.8	-1.34
Change (%) in Total Premium (log transformed) 2	4.65	0.66	4.61	0.99	0.31
No. of Policies in Force (Before)	302.3	596.9	116.3	85.6	2.87***
No. of Policies in Force (After)	322.8	679.1	106.2	78.6	3.09***
Change (%) in No. of Policies in Force	14.7	40.1	6.2	34.1	1.46
Change (%) in No. of Policies in Force (log transformed)	4.70	0.25	4.63	0.26	1.95**
Commisions (Before)	25.1	49.0	10.3	8.3	2.76***
Commisions (After)	30.4	74.9	9.4	9.2	2.65***
Change (%) in Commisions	25.6	73.9	88.8	397.2	-1.27
Change (%) in Commisions (log transformed)	4.65	0.62	4.62	0.92	0.27
New Business Policies (Before)	7.8	9.3	3.8	3.4	3.70***
New Business Policies (After)	9.1	14.2	2.8	2.0	4.12***
Change (%) in New Business Policies	14.8	76.6	25.7	178.2	-0.45
Change (%) in New Business Policies (log transformed)	4.59	0.53	4.39	0.85	1.63*

***p≤ .01 **p≤ .05 *p≤ .1

1 Change is calculated as (after-before)*100/before for each agent and then mean values reported for the entire sample.

2 Due to high skewness in the distributions, log tranformations provide more appropriate comparisons of percentage changes.

complement the richness of in-depth case studies. Such a move would ensure that our prescriptions for electronic integration have not only theoretical validity but also empirical support.

For this specific research, the implication is that this broad-brush design should be complemented by a study that focuses at the level of the interfaced agent. Such a study would shed light on the determinants of variance in performance within this set of agents, given that electronic integration alone does not determine agents' performance. The role of organizational transformation in fully exploiting the benefits of electronic integration should also be considered .

Finally, it is fashionable to call for longitudinal designs in virtually any stream of research, but this study provided some support for its use in this area. The possibility of learning and the larger question of sustainability of benefits underscores the usefulness of longitudinal designs.

5. CONCLUSIONS

This study focused on the effects of electronic integration (through proprietary standards) of one major carrier with a set of independent agents. The effects of electronic integration were assessed from the perspective of the focal carrier in terms of the *degree of increases in performance* reported by a sample of interfaced agents as compared to a matched set of non-interfaced agents. The results (especially the non-parametric test results) indicate modest support for the hypothesis of performance effects due to integration. In addition, there seems to be an interesting "learning" effect, since agents interfaced for a year show significant increases in performance over corresponding agents not interfaced with difference absent at the six-month mark.

6. ACKNOWLEDGEMENTS

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8. ENDNOTES

1. Discussions with the managers and agents indicates that this is an appropriate window. There is an obvious trade-off. If the "window" is too small, the effects may not be observed, while if the window is too large, the impact of other confounding effects can not be ruled out within this design.

2. The sample sizes for the two groups are not exactly the same due to missing values for some of the performance measures but, on average, the sample size is around 80 for each.