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Planning and firm performance: effects of multiple planning activities and technology policy

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Keywords

strategic planning, formal planning, informal planning, operational planning, technology policy, and firm performance

Disciplines

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Comments

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PLANNING AND FIRM PERFORMANCE: EFFECTS OF MULTIPLE PLANNING ACTIVITIES AND TECHNOLOGY POLICY

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PLANNING AND FIRM PERFORMANCE: EFFECTS OF MULTIPLE PLANNING ACTIVITIES AND TECHNOLOGY POLICY

Abstract

Our concern in this paper is a longstanding one in the field of strategic management- the effect of strategic planning on firm performance. However, we argue that strategic planning is best examined in context of both its formal and informal aspects, as well as with operational planning and technology policy. From a survey of 150 manufacturing firms, planning and performance data were obtained from top managers. Our results provided support for the general argument that both formal and informal planning pay, and that both operational planning and technology policy have significant associations with firm performance.

Key words: strategic planning, formal planning, informal planning, operational planning, technology policy, and firm performance.

Introduction

Strategic planners are asked to process tremendous amounts of information, much of which is both strategic and operational. This process requires planners to become extremely adept at translating information into plans and integrating plans with actions. And organizations, properly managed, can then become sources of continual innovation and adaptability. No matter how carefully they may be formed, without integrating strategic plans into coherent technology policies; there can be little sustained organizational effort of any lasting effect [14].

Many feel these principles hold true for all managers developing formal strategic plans in difficult environments [1, 13, 29, 33]. Formal strategic planning without consideration of informal activities and operational capabilities is destined to result only in a formal document [26]. And resources alone do not automatically translate into advantage without some form of coherent technology policy that links strategy with capability [28, 31, 37, 48].

Therefore, it is apparent that if we are to understand how formal strategic planning potentially affects performance, it needs to be studied in conjunction with concomitant informal activities and policies of implementation. And it is for this purpose this study was conducted. For the first time, we examine the effects of formal strategic planning on firm performance while also considering the informal planning and technology policy activities within the firm. Specifically, our concern is a longstanding one in the field of strategic management- the effect of formal planning on firm performance. Yet with formal planning we also simultaneously examine informal and operational planning, and technology policy, as potential firm performance predictors. In order to accomplish this, we draw on a survey of planning and policy practices reported by top level executives in manufacturing firms. The executive responses are used to gauge the planning effects on performance at the firm level.

Formal Strategic Planning and Firm Performance

For the past three decades numerous studies have been conducted examining the relationship of formal strategic planning with firm financial performance, and there have

been at least ten published literature reviews addressing the topic [4, 7, 9, 19, 24, 34, 39, 40, 42, 47]. Early studies comparing formal with informal planners resulted in conflicting evidence as to the performance benefits of planning. For example, Armstrong's 1982 review of formal practices concluded with a relatively positive view of planning. However, Shrader et al. [42], in a general review of the literature, found no systematic relationship between formal planning and financial performance. And, over time, there emerged a stream of studies and writings debating the issue. Foremost among these was the work of Henry Mintzberg [26] who took a very critical view of strategy as planning in general, and strategic planning in particular. Mintzberg's central thesis, in his critically acclaimed book *The Rise and Fall of Strategic Planning*, was that because strategy involves synthesis and planning requires analysis, they are not necessarily compatible. In the same vein, in a general historical review in their book *Strategy Safari*, Mintzberg, Ahlstrand, and Lampel [27] place the moniker of "planning school" on the formal planners. And they perpetuate the claim that strategic planning is not strategy making, because the link between analysis and synthesis is not necessarily made by planners.

The influence of the work of Mintzberg and his colleagues has been profound, and over the years simple planner versus non-planner studies appeared much less frequently in the literature. Attention has shifted to studies more focused on the issue of how and under what circumstances planning leads to improved performance.

Moreover, recent papers continue to report both positive and negative planning/performance results, but these studies appear to be somewhat more focused in terms of the conditions under which planning is examined. For example, Baker and Leidecker [5] found a strong relationship between emphasis placed on planning and firm financial performance among agribusiness firms. Phelps, Chan, and Kapsalis [36] in studies of two UK industries, consultancy and water treatment, found formal scenario planning to pay off for firms in terms of financial returns. Conversely, one executive's experience [43] led him to conclude formal planning was not beneficial in a consumer products firm. And for a sample of US exporting firms, Walters [46] found no consistent planning/performance relationship. Still others [48] argue that certain internal firm capabilities, namely technology policy, determine the strength of the strategic

planning/performance link. Indeed the effects of planning on performance may be industry specific and perhaps a function of planning skill.

Still other planning performance studies have considered strategic planning in relatively more specific contexts, along with other forms of planning. For example, Shrader, Mulford and Blackburn [41] examined small business strategic planning in concert with operational planning. They conclude that operational planning and environmental uncertainty are equally or more important than strategic planning in determining the performance of small firms. Correspondingly, Odom and Boxx [30] found formal planning improved the growth performance of churches. Powell [38], in a study of two separate industries, controlled for the diffusion of planning expertise among firms within industries. He concluded that when planning skills are not widely used within an industry, the planning performance relationship is more likely to be positive. In other words, planning became a competitive advantage for firms when not widely available. Powell also argued that the strategy process could be viewed as a source of competitive advantage and that future research should consider various aspects of process along with the formal existence of plans.

One study, by Brews and Hunt [8] examining planning in context with environmental and temporal factors, found both formal and incremental planning to be part of effective planning process. They viewed their study as a resolution of the planning school versus learning school debate, and that planning is an integral and important management function. Brews and Hunt contend that procedures should be put into place to ensure learning is accomplished along with planning.

Meta Analyses

There have been four meta-analytic reviews centering on the basic planning/performance question, demonstrating rather consistent findings. Boyd [7], Schwenk and Shrader [40], Capon et al. [9], and Miller and Cardinal [24] performed meta-analyses, and all found small but significant relationships between formal planning and firm performance. Boyd [7] aggregated the findings of 29 studies and found planning to have modest correlations with nine performance measures. Capon et al. [9] updated Boyd's analysis with similar results. Miller and Cardinal [24] in their meta-analysis of 26 studies

found planning to positively influence performance while contingency factors proved to be of relatively less importance. Schwenk and Shrader [40] focused their meta-analysis on small firm planning and financial performance, and again found a small but significant positive planning/ performance relationship. Taken together, these meta-analyses indicate that across various samples and studies formal planning does have a positive impact on performance. Thus, the literature up through 1994 is conclusive regarding this positive relationship. However, the meta-analysis authors are in agreement that the statistical effects are not overly strong and that the influence of other factors must always be considered. The contribution of this paper is that it considers the effects of these other factors- including informal and operational planning and technology policy, along with formal written planning and firm performance.

Planning or Operational Execution?

Theoretical arguments pertaining to this review derive from several related thrusts. One considers managerial decision-making/strategy-making to be the driving force within the firm and includes the work of Andrews [2], Child [10], Lorange and Vancil [22], and Henderson [18]. Simply stated, in this view strategic planning is seen to help managers make significant decisions and help co-align structures, technologies, and environments.

Another theoretical perspective upon which we draw comes from what Mintzberg et al. [27] term the “learning school.” In this view, planning is seen as less a formal activity and more as a set of continuous incremental decisions and actions. Over time, these actions and decisions coalesce to form the major impetus for firm direction. Strategy becomes an emergent process. The informal aspects of decision making and continual learning take on great importance. Emergent strategy takes many forms [25]. It includes the efforts of leaders, both ideological and entrepreneurial, and a variety of organizational processes.

Moreover, learning-based planning should be informal and not formulated. For instance, Slater and Narver [44] argue that in the learning organization, planning is often guided by the vision of decision-makers, and is made operational through responsive and

flexible overlays of task-oriented planning activities. Therefore, planning is tied with learning.

A slightly different view sees operational execution as what matters and not strategy content. In the words of Nohria et al. [29] “It’s not *what* you execute that matters but *how* (emphasis added). Recent empirical works by Collins [12] and Nohria et al. [29] suggest that superior implementation of any reasonable strategy is better than adequate implementation of good strategy.

Consequently, a philosophical debate has ensued with learning school adherents extolling the role of informal creativity and the formal planners claiming to be rational decision-makers. Yet we deem these various perspectives to be complementary, at least in terms of what should be considered when studying planning/performance relationships. Both the formal and informal aspects of strategy need to be examined conjointly, along with organization actions supportive of planning [33]. Strategy formation is much too complex a phenomenon to be completely defined by either formal or informal activity alone. Taken together, these views affirm that strategy and technology must work in concert to help managers rationalize, configure and move the organization toward performance.

As a result of this review, we feel a study is needed that treats formal and informal planning independently, and not as part of one continuum. Additionally, we feel that planning effects on performance should be examined within a somewhat controlled industry context- firms facing similar environments and employing similar technologies. And we argue that along with strategic planning, the internal technology policy and operational planning practices of firms should be considered as covariates in determining the effects, if any, strategic planning has with firm performance. In other words, formal, informal, operational and technology aspects of planning should be considered together to help further our understanding of this long standing issue of whether or not planning pays.

Strategic Planning and Technology Policy

Therefore, we turn our attention to the issue of the technology policy of firms. Technology policy is defined as choices executives make regarding the development and

deployment of multiple technologies to achieve firm goals [48]. Effective technology policies enhance the fit between the strategic plan and the deployment of firm resources [16]. And some argue that strategy and technology policy must also be in congruence in order for the firm to perform well [14, 16, 28, 31, 37]. Thus, the link between strategy and performance is strengthened by organizational variables such as the degree of emphasis placed on manufacturing and quality [32].

Related to this is the view that strategic planning and core technology are strongly linked in determining firm performance [23, 45]. Whether this linking is undertaken formally or informally doesn't really matter. What is of primary concern is that strategy is used to configure a system that helps managers make sense out of uncertain situations. Administrative choices of technologies and structures help execute strategy and strategic plans [23].

Probably the most complete study to date is Zahra and Covin's [48] examination of technology policy with competitive strategies. Zahra and Covin, employing a sample of manufacturing firms, found that technology policy must fit well with competitive (or business-level) strategy in order for a firm to be effective. The notion was that a sound technology policy helps a firm integrate many internal value chain activities in attempting to effectively portray cost leader or differentiation strategies.

Betz [6], for a series of case studies, argued that effective strategic planning, along with statements of objectives and environmental assessments, would also include technology strategy/policy. Technology strategy/policy, as defined by Betz, involves a significant effort to integrate R&D budgeting, technology needs forecasts, and other operational activities in conjunction with the general plan.

In a similar vein, Christensen's [11] notion of managing disruptive technological change indicates managers must be willing to fit strategy with technology, perhaps several technologies, in order to be successful. The strategic application of technology inextricably links both internal operations and customers in the determination of the performance of firms.

As a result, we've come to view technology policy as the extent to which firm managers write into their plans means for integrating principles such as production improvement techniques, R&D spending, product development, and personnel

recruitment. Technology policy includes a variety of improvement-related activities, skills, and knowledge- with special emphasis on R&D and operations. It is the essence of managerial ability to translate know-how into goal related effort.

Hypotheses

Given the findings of the meta-analyses and general review reported above, we expect formal strategic planning to be found in association with firm financial performance [24]. Moreover, we would expect informal planning activities to potentially enhance performance as well [26].

Consequently, we offer the following hypotheses:

Hypothesis 1: The existence of both formal and informal strategic planning activity will be positively associated with firm financial performance.

We see no provision or caveat in the extant literature suggesting that these planning forms are mutually exclusive neither is there an indication that one form necessarily decreases or increases the other. What is more likely, according to our review, is that operational planning and technology policy act to strengthen the relationship of planning with performance. Therefore, we hypothesize:

Hypothesis 2: The existence of formal and informal strategic planning in conjunction with technology policy and operational planning will be positively associated with firm financial performance.

The literature cited above suggests that planning/performance relationships are affected by things beyond the simple existence of plans. The degree of formal planning including time horizon [8], the external environment [23], and operational planning [29, 41] should all be considered. Therefore, we offer the following:

Hypothesis 3: The degree of formal planning, planning time horizon, technology policy, and operational planning will be positively associated with firm performance.

Methodology

Survey and Sample

The sample for this study was drawn from a database of firms associated with a center for industrial research and service at one of the premier land grant institutions in the United States. The mission of this center - to enhance the performance of local industry - is an integral part of the extension arm of the university. The center's functions include: undertaking feasibility studies, conducting market analyses, developing marketing plans, counseling management, providing counsel to industry on special problems, and providing technical and managerial information through conferences and newsletters.

The questionnaire developed for this study was a nine-page booklet with sections devoted to formal planning, operational planning, technology policy, environmental uncertainty, and firm characteristics. We pilot tested the questionnaire with eleven members of the university's Master of Business Administration executive program who represented some of the largest and most important firms in the region. For the most part, executives completing the pilot test found our questions to be appropriate and understandable. However, they expressed concern over our original attempt to gather explicit financial performance numbers. Consequently, we revised and designed questions tapping firm performance to be relatively general so as to protect the confidentiality of respondents.

We sent surveys to the 597 manufacturing firms listed in the database. This constituted virtually all the manufacturing firms in the database and in the geographical region. Of these 597 firms, 150 returned usable questionnaires for a response rate of 25 percent. This corresponds very favorably to rates published elsewhere [46]. All survey firms operated in the manufacturing sector of the regional economy. Of these, 68 were privately-held companies, 63 were corporations, 16 were S-corporations, and one was a partnership. Two firms chose not to identify their corporate form.

Firm products ranged from precision aero-space technologies to ice and food commodities. Among the firms participating in the study were printers, tool makers, chemical and plastic processors, farm equipment manufacturers, pump and motor makers,

industrial equipment and tool makers, and heating and air conditioning companies. The average firm in our sample had been in existence for 49 years, with a range from one to 152 years. The average size in terms of full-time employees was 372.

One important issue of methodology in surveys on formal planning has to do with the position of the target respondent or key informant. We directed our survey to the chief executive or executive in charge of strategic planning for the firm. Of our respondents, 64 were CEOs, 53 were managers (plant managers or vice presidents), 17 were strategic planners, and 13 held some other significant staff position such as CFO, controller, or director of research and development. Three survey firms elected not to provide specific information regarding the position of the person completing the questionnaire. Given these frequencies, we feel we met the goal of surveying the key informant.

Planning Characteristics in Firms

Of the 150 firms in our sample, 103 reported having formal/written long-range strategic plans. The most common formal planning feature was budgeting with 101 firms indicating some form of written budgeting procedure. Additionally, 99 of our sample firms reported having formal written statements of objectives, 95 had formal mechanisms for corrective action and feedback, 91 developed written pro forma statements, and 87 had formal assessments of environmental factors. Taken together, most of the sample firms developed relatively comprehensive written strategic plans.

The average strategic planning time horizon was 2.7 years, with a range of 1-11 years. A total of 46 sample firms reported having strategic plans covering a one-year time frame. There were 10 firms with two-year plans, 19 firms with three-year plans, one firm with a four-year plan, 23 firms planned for five years, two firms for 10 years, and one firm reported an eleven-year planning cycle. This descriptive information suggests firms view strategic planning as a much more short-term tool than indicated by traditional management literature. Still a good number of firms practiced a more traditional five-year planning approach.

As for informal planning, 88 surveyed firms reported some sort of activity in this area. A total of 39 firms said they engaged in no informal planning while 23 firms

offered no response to this item. Of the informal planners, 50 firms indicated top managers were involved, 16 said their planning teams planned informally, and 20 firms involved various organizational groups in informal planning efforts. Only two of the 88 informal planning firms chose not to respond to this question.

Informal planning was composed mostly of various forms of analysis, including intelligence gathering and analysis of historical trends. Firms also reported informal planning discussions, forecasting, budgeting and goal-setting. Most informal planning was performed on a monthly or quarterly basis. And most of the informal planning was oriented toward external and internal environment and performance issues.

Measurement of Variables

Exhibit 1 presents the survey items used to measure the formal strategic and operational planning activities, technology policy, and environmental uncertainty variables considered in this study. All items were obtained from the mailed survey instrument.

Formal Planning - One of the key variables in the study is formal planning. We followed convention of previously published research in developing our formal planning measures. Several previous studies measured formal planning in terms of its component parts [42]. This means assessing whether the firm has a written document including statements pertaining to the following:

- Quantified objectives for – earnings, return on investment, capital growth, share of the market, sales/earnings ratio
- Pro forma financial statements including – balance sheets, cash flow analysis, income statements
- Plans and budgets for – human resources, hiring and personnel development, plant expansion, equipment acquisition, R&D, advertising, technology acquisition and utilization
- Identification of external factors including – political developments, social issues, technological breakthroughs, labor/personnel issues, economic trends, international competition

- Procedures for detecting differences between planned and actual performance and having in place mechanisms for correcting or preventing differences

Firms were asked to indicate whether or not they had a formal written strategic plan and whether they practiced the techniques listed above. Consequently, we were able to classify firms as either having or not having formal plans. This measure is denoted by the term “written plan” in the subsequent analysis and tables.

Our measure for degree of formal planning is a summative scale of the components above. The more the five practices listed above are used by a firm, the higher the level of formal planning. Thus, on a scale of 0-5, the more formal planners have implemented more of the techniques and have a higher score. This measure corresponds to numerous studies involving planning typologies [20, 42].

We also obtained from firms an indication of the time frame in years encompassed by the formal plan. This measure is straightforward. Firm managers reporting formal strategic plans were asked to specify what time period their plans covered.

Informal Planning – There are not many, if any, instances in the literature where informal planning is explicitly measured. Most studies assume formal and informal planning to be part of one continuum. In our study, however, we asked firms to indicate whether or not they performed any informal, non-written planning. We also asked directly as to who was involved, what was done, what tools were used informally, and what issues were considered. Firms indicating some type of informal planning activity were classified as informal planners. We feel this allows for an independent assessment of informal or emergent planning.

Operational Planning – Our measure for operational planning was a 21-item instrument dealing with the extent to which firms engaged in certain activities on a regular basis. We conceive operational planning to be the setting of relatively short-term objectives for specific business functional areas such as finance, production, marketing and personnel management [20, 41]. Likert-scale responses to short-range issues such as six-month forecasting, analyzing target customers and analyzing major products were collected from survey firms. High levels of agreement on the scale are associated with high levels of operational planning activity. Responses were factor analyzed as a single

item with factor scores used in subsequent multivariate analyses. We calculated Cronbach's alpha, a common measure of reliability [17] for this scale. The coefficient alpha for the scale was high at .90. Hair, Anderson, Tatham and Black [17] state that a standard threshold level for alpha is .70, and given this criterion, our operational planning scale is reliable.

Exhibit – 1 about here

Technology Policy – Our technology policy measures were adapted from articles by Marone [28] and Zahra and Covin [48] on the same topic. Our measures also reflect what Porter [37] terms policies that “enhance overall competitive position.” In building the measures, we attempted to capture the notion of how manufacturing firms integrate technological content into decisions. A 15-item scale was developed centering on the extent to which firms internally implemented various aspects of technology policy. A high level of agreement by a respondent on the scale can be seen as a high level of deployment of technology for the achievement of firm objectives. Again, responses were factor analyzed as a single factor and factor scores were input in subsequent analyses. Cronbach's alpha for this scale was high at .87.

Environmental Uncertainty – This scale includes 12 items and is similar to many uncertainty scales published in previous research [21]. It includes items devoted to uncertainty regarding raw material suppliers, equipment suppliers, labor supply, distributors, customers, value chain competitors, industry competitors, government regulation, political issues, unions, industry technological change, and new products. Factor scores were also generated for this scale, and Cronbach's alpha was .72.

Firm Performance – Because many of the firms in our sample are privately held, we were not able to obtain from them detailed financial performance information, nor was financial information about them publicly available. For this fact and by reason of the pilot test results reported above, we were inclined to form performance measurement items of a more general nature. Consequently, we asked firms to compare themselves to their competitors for the past year on sales growth, net income growth, return on

investment, and market share growth. These are among the most common and popular indicators of successful strategy [13].

Top managers responded to five-item Likert-scales indicating whether they were doing much worse to much better than the competition. Perceptual measures such as these have been used in other planning studies [8] and have been found to be positively correlated with objective performance measures in other research [15]. While our measures are both subjective and self-reported, because we have tapped the key respondents we feel we have good indicators of overall firm performance.

Analysis and Results

Table 1 presents a correlation matrix for the continuous variables analyzed in this study. The inter-correlations for the four performance variables, understandably, are relatively high; however, not so much so as to undermine the independence of each measure. Also, the correlations among the other measures are such that the traditional assumptions for multi-variate analysis should hold. Pedhazur [35] describes correlation coefficients in the .1-.2 range as being low. Many of our correlations fall in this category. Pedhazur further denotes correlation of .8 and above to be high. We have no correlations in this category. There are no negative correlations and both operational planning and technology policy appear to have fairly strong correlations with most other study variables. Subsequent analyses indicate significant relations among independent and dependent variables. Therefore, we do not consider multi-collinearity among the variables to be a potential problem.

Table – 1 about here

Analysis of variance (ANOVA) was the statistical technique chosen to test the hypotheses relative to the effects of formal and informal planning on performance. Firms were classified nominally as to whether they practiced both formal and informal planning, and then compared on the performance measures. Procedurally, analyzing the

effects of categorical independent variables with continuous dependent variables is accomplished by employing ANOVA [3].

The ANOVA table (Table – 2) indicates several interesting results. First, both formal and informal planning measures exhibit significant main effects with the sales growth performance of firms ($p < .05$). The interaction effect is not significant, however. The highest sales growth mean is for firms indicating both formal and informal planning, followed by firms with informal planning practices only. A Fisher's post hoc test for sales growth with informal planning is significant ($p < .05$). Post hoc Tukey tests ($\alpha = .05$) also demonstrate that informal planning generates a significant mean difference effect with sales growth. Tukey tests show the mean difference between informal planning groups is .353 ($p < .05$), while the mean difference for written planning is only .236 ($p < .18$).

There is no strong relationship for planning with income growth. However, again the highest income growth mean is found with firms that plan both formally and informally.

Formal written planning does have a small but significant main effect with ROI ($p < .1$), and formal planner mean performance on this measure is greater than for informal planners. Firms with both formal and informal planning practices outperform others in terms of ROI. Post hoc tests confirm a significant mean difference ($p < .1$) for written planning with this performance measure.

Market share growth is where the strongest main effects are exhibited. Both formal and informal planning are significant at $p < .05$ and $p < .01$ respectively, and Fisher post hoc tests result in significant mean differences for both planning measures (written plan - $p < .1$; informal planning – $p < .05$).

Taken together, the ANOVA results provide good support for hypotheses 1. Indeed, both formal planning and informal planning are associated with sales and market share growth at significant levels. The effects for informal planning are slightly stronger than for formal planning for these two performance measures. Formal planning also has a significant association with ROI.

Table – 2 about here

Analysis of covariance (ANCOVA) was used to test the effects of strategic planning on performance in conjunction with technology policy and operational planning. ANCOVA allows the consideration of the continuous technology policy and operational planning variables in the analysis with the other strategic planning variables and performance [3]. Alternatively stated, operational planning and technology strategy were used as covariates. These results are presented in tables 3 and 4.

When technology policy was entered in the analysis as a covariate the results are affected dramatically. For sales growth, there is a marginally significant main effect with technology policy ($p < .1$). None of the other variables or interactions indicates a strong relationship. Part of this could be due to the fact that only 105 firms supplied enough information to analyze covariates compared with 123 in the regular ANOVA. The ANCOVA analyses for both income growth and ROI show no significant main effects or interactions. There is, however, a limited but significant main effect for technology policy in the ANCOVA for growth in market share ($p < .1$). No post hoc mean difference tests for the analyses in table 3 are significant.

Therefore, the covariate technology policy in these instances, explains only a mixed degree of the differences in firm performance beyond the differences in planning characteristics. What's more, technology policy seems to simultaneously lessen and subsume the impact of planning on performance in a general sense. Technology policy seems to take on most importance for the market-performance measures rather than the profit measures. Consequently, with respect to the covariate technology policy there is mixed support for hypotheses 2.

Results for ANCOVA analyses with operational planning are given in table 4. There are several more significant relations demonstrated by operational planning than technology policy. For sales growth, both formal and informal planning exhibit significant main effects ($p < .05$, $p < .01$), and the interactions of formal and informal planning, and informal and operational planning are significant or marginally significant

($p < .05$, $p < .1$). Thus it appears that all forms of planning are linked with firm sales growth.

Operational planning has a statistically significant association with the other three performance variables in table 4. The main effects are strong and consistent across these three performance measures. Also, informal planning has a significant main effect ($p < .01$) with market share growth. There was one significant post hoc Fisher test for informal planning with market share ($p < .05$) for this group of analyses. Operational planning appears to be as important in performance terms as do the other planning and technology policy measures. Thus, in terms of operational planning, there is good support for hypotheses 2.

Tables – 3 and 4 about here

Ordinary least squares regression was chosen to analyze the effects of degree of formal planning, planning in terms of years, environmental uncertainty, operational planning, technology and performance. This is because these variables were continuous and we wanted to examine the relationship between the dependent and independent variables taken together [3]. Results of this analysis are provided in table 5. Across the four performance measures, technology policy stands out as the variable with the most predictive power. Technology policy has a significant association with all the performance variables except ROI, and in that case the relationship is strong but barely misses being significant. Operational planning has a marginally strong association ($p < .1$) with ROI. Technology policy and operational planning results support the hypothesis. However, neither the degree of formal planning nor the variable for number of years covered by the plan, have an effect on performance. And in general, the regressions do not explain a great deal of performance variance. Therefore, there is only mixed support for hypothesis 3.

Table – 5 about here

Discussion and Conclusion

The fundamental objective motivating this research was designing a study that shifts the attention in planning/performance investigations from formal planning only to a wider range of planning activities; namely, formal planning, informal planning, operational planning, and technology policy/forecasting. To date, no previous researchers have made a systematic inquiry into the basic influences of these activities on firm performance. Because of the narrow conception of formal planning guiding past research, the other measures of planning activity included in our study have been given only glancing consideration.

Our findings, that formal and informal strategic planning, along with technology policy, are associated with firm financial performance, seem to reinforce previous research. Our results seem to square especially with the meta-analytic reviews [24, 40] in that the effects of planning with performance do not appear to be overwhelmingly strong. Nonetheless, they are present and consistent for various types of performance.

Not only are our findings consistent with the meta-analytic reviews of formal planning, but they are also consistent with the writings of Mintzberg in terms of informal planning activities. For the most part, we found informal planning to be of similar value as formal planning in explaining the performance of firms. Our study is among the very first to consider formal and informal planning activity together, and our results indicate that informal activity is important. Yet the extent and nature of informal planning activity needs to be better conceptualized. For example, we make the induction that informal and emergent are, in effect, the same thing. In our study, the informal aspects of planning are well known to managers. But it seems plausible that the emergent aspects of strategy may not always be known. Future research should delve more deeply into the various components of informal activity, and should include informal/emergent aspects of planning in the development of planning typologies.

Additionally, this study seems to confirm Powell's [38] notion of planning diffusion and performance. It seems that many manufacturing firms in our sample practice planning. Consequently, planning is probably not a clear competitive advantage

for the firms in this industry, and because of this fact, planning effects on performance may be less pronounced. Therefore, it is clear that industry factors affect planning performance relationships, and we controlled for the effects of industry in our study. Yet industry differences and elements of planning diffusion should be examined and classified more completely in future research.

Perhaps equally significant are the findings for technology policy and operational planning. One conclusion we can draw is that operational planning and technology policy are the primary explanatory variables in the planning/performance relationship. We have provided evidence that aligning operational activities through operational planning and technology policy enhances the financial performance of firms. Specifically, it appears from our findings that technology policy potentially plays a significant role in linking planning with performance. Firms with greater deployment of multiple technologies to achieve objectives perform better than those firms with less developed technology policies. Our findings here are consistent with Zahra and Covin [48] and point to the importance of including technology policy in all future studies of planning and performance.

As for operational planning, we also find strong links with performance. Firms engaging in a variety of short-range forecasting techniques tend to perform well. This is consistent with previous research [8, 41], and is consistent with learning and decision maker choice theories. Our findings here add credence to the idea of examining a comprehensive set of activities when undertaking planning performance studies [33]. Also, given the potential importance of both technology policy and operational planning on performance, future efforts to standardize definitions and measures for these two phenomena seem warranted and should be undertaken.

However, because this research merely confirmed the association between both technology policy and operational planning and firm performance, and did not establish a causal link, future research should seek to address this association through other methods and rigorous longitudinal designs. Moreover, our view of technology policy and operational planning as covariates should be questioned. Future research should address the extent to which technology policy and operational planning are integrated with formal strategic planning in actual firm practice.

One clear limitation of this research discussed earlier is the nature of the firm performance variables. Our financial performance measures are perceptual rankings of top managers on various aspects of firm growth. While these measures come from executives in positions to make accurate assessments, we have no objective measure to confirm their accuracy. We feel the ownership structure characterizing most the firms in our sample dictated this outcome. Consequently, future research with objective measures should be undertaken.

A legitimate question might be raised as to how our results generalize beyond this sample of regional manufacturing firms. One possibility, of course, is that the relationships found in these data would be stronger in a sample exhibiting more variation on the planning variables. Most of our sample firms engaged in some form of planning and their planning efforts were oriented toward the near-term. Given that we found significant planning/performance relationships, it seems reasonable to presume that firms with largely disparate planning practices would experience more variety in performance. Yet we did control for industry setting, and we included responses from top executives, so our sample should be considered representative of the phenomena studied.

This research should prove useful to administrators and managers in a variety of organizational settings. It has long been recognized that strategy, whether a formally planned or emergent activity, is important in the success or failure of firms (Armstrong, 1982). Therefore, managers seeking to enhance performance are well advised to blend strategic planning activities to fit the needs of their particular organizations. Furthermore, it appears that managers have some leeway as to build planning systems, because all aspects of planning are important.

Regardless of individual writings claiming that planning does not pay, the empirical evidence indicates that it does. Our study adds to this growing body of evidence, and adds value in that we've identified technology policy and operational planning to be important contributing explanatory variables. If organizations are to realize the benefits of strategic planning, then the means by which plans are linked with strategic activity need to be better understood.

References

1. Allison, M. & Kaye, J. (1997). Strategic planning for nonprofit organizations: A practical guide and workbook. New York: John Wiley.
2. Andrews, K. (1971). The concept of corporate strategy. Homewood, IL: Dow Jones-Irwin.
3. Andrews, F., Klem, L., Davidson, T., O'Malley, P. & Rodgers, W. (1981). A guide for selecting statistical techniques for analyzing social science data. Ann Arbor: Survey Research Center, Institute for Social Research, the University of Michigan.
4. Armstrong, J. (1982). The value of formal planning for strategic decisions. Strategic Management Journal, **3**, 197-211.
5. Baker, G. & Leidecker, J. (2001). Does it pay to plan?: Strategic planning and financial performance. Agribusiness, **17**, 355-364.
6. Betz, F. (1987). Managing technology: Competing through new ventures, innovation, and corporate research. Englewood Cliffs, NJ: Prentice-Hall.
7. Boyd, B. (1991). Strategic planning and financial performance: A meta-analytic review. The Journal of Management Studies, **28**, 353-374.
8. Brews, P. & Hunt, M. (1999). Learning to plan and planning to learn: Resolving the planning school/learning school debate. Strategic Management Journal, **20**, 889-913.
9. Capon, N., Farley, J. & Hulbert, J. (1994). Strategic planning and financial performance: More evidence. The Journal of Management Studies, **31**, 105-110.
10. Child, J. (1972). Organization structure, environment, and performance: The role of strategic choice. Sociology, **6**, 1-22.
11. Christensen, C. (1997). The innovator's dilemma: When new technologies cause great firms to fail. Boston, MA: Harvard Business School Press.
12. Collins, J. (2001). Good to great: Why some companies make the leap...and others don't. New York: Harper Business.
13. Day, G. (1997). Maintaining the competitive edge: Creating and sustaining advantages in dynamic competitive environments. In Day, S. and Reibstein, D. (Eds.), Wharton on Dynamic Competitive Strategy, New York: John Wiley, 48-75.
14. Downes, L. (2002). The strategy machine: Building your business one idea at a time. New York: Harper Business.

15. Geringer, J. & Hebert, L. (1991) Measuring performance of international joint ventures. Journal of International Business Studies, **22**, 249-263.
16. Goodman, R. & Lawless, M. (1994). Technology and strategy: Conceptual models and diagnostics. New York: Oxford University Press.
17. Hair, J., Anderson, R., Tatham, R., & Black, W. (1995). Multivariate data analysis, Englewood Cliffs, New Jersey: Prentice Hall.
18. Henderson, B. (1984). The logic of business strategy, Cambridge, MA: Ballinger Publishing.
19. Hofer, C. (1976). Research on strategic planning: A survey of past studies and suggestions for future efforts. Journal of Economics and Business, **28**, 261-286.
20. Kargar, J. & Parnell, J. (1996). Strategic planning emphasis and planning satisfaction in small firms: An empirical investigation. Journal of Business Strategies, **13**, 42-64.
21. Lewis, G. & Harvey, B. (2001). Perceived environmental uncertainty: The extension of Miller's scale to the natural environment. Journal of Management Studies, **38**, 201-233.
22. Lorange, P. & Vancil, R. (1977). Strategic planning systems. Englewood Cliffs, NJ: Prentice-Hall.
23. Miles, R. & Snow, C. (1978). Organizational Strategy, Structure, and Process. New York: McGraw-Hill.
24. Miller, C. & Cardinal, L. (1994). Strategic planning and firm performance: A synthesis of more than two decades of research. Academy of Management Journal, **37**, 1649-1665.
25. Mintzberg, H. & Waters, J. (1985). Of strategies, deliberate and emergent. Strategic Management Journal, **6**, 257-272.
26. Mintzberg, H. (1994). The rise and fall of strategic planning. New York: Free Press.
27. Mintzberg, H., Ahlstrand, B. & Lampel, J. (1998). Strategy safari: A guided tour through the wilds of strategic management. New York: Free Press.
28. Morone, J. (1989). Strategic use of technology. California Management Review, **31**, 91-110.
29. Nohria, N., Joyce, W. & Roberson, B. (2003). What really works. Harvard Business Review, **81** (July), 43-52.

30. Odom, R. & Boxx, W. (1988). Environment, planning processes, and organizational performance of churches. Strategic Management Journal, **9**, 197-205.
31. Parnell, J. (1997). New evidence in the generic strategy and business performance debate: A research note. British Journal of Management, **8**, 175-181.
32. Parnell, J. (2000). Reframing the combination strategy debate: Defining forms of combination. Journal of Applied Management Studies, **9**, 33-54.
33. Parnell, J. (2003). Five critical challenges in strategy making. SAM Advanced Management Journal, **68**, 15-24.
34. Pearce, J., Freeman, E. & Robinson, R. (1987). The tenuous link between formal strategic planning and financial performance. Academy of Management Review, **12**, 658-675.
35. Pedhazur, E. (1973). Multiple regression in behavioral research: Explanation and prediction. (2nd edition), New York: Holt, Rinehart and Winston.
36. Phelps, R., Chan, C. & Kapsalis, C. (2001). Does scenario planning affect performance? Two explanatory studies. Journal of Business Research, **51**, 223-232.
37. Porter, M. (1985). Technology and competitive advantage. The Journal of Business Strategy, **5**, 60-78.
38. Powell, T. (1992). Strategic planning as competitive advantage. Strategic Management Journal, **13**, 551-558.
39. Robinson, R. & Pearce, J. (1984). Research thrusts in small firm strategic planning. Academy of Management Review, **9**, 128-137.
40. Schwenk, C. & Shrader, C. (1993). Effects of formal strategic planning on financial performance in small firms: A meta-analysis. Entrepreneurship: Theory & Practice, **17**, 53-64.
41. Shrader, C., Mulford, C. & Blackburn, V. (1989). Strategic and operational planning, uncertainty, and performance in small firms. Journal of Small Business Management, **27**, 45-60.
42. Shrader, C., Taylor, L. & Dalton, D. (1984). Strategic planning and organizational performance: A critical review. Journal of Management, **10**, 149-171.
43. Simpson, D. (1998). Why most strategic planning is a waste of time and what you can do about it- part II. Long Range Planning, **31**, 623-627.

44. Slater, S., & Narver, J. (1995). Market orientation and the learning organization. Journal of Marketing, **59**, 63-75.
45. Thompson, J. (1967). Organizations in action. New York: McGraw-Hill.
46. Walters, P. (1993). Patterns of formal planning and performance in U.S. exporting firms. Management International Review, **33**, 43-56.
47. Wortman, M. (1986). A unified framework, research typologies, and research prospectuses for the interface between entrepreneurial and small business. In Sexton, D. and Smilor, R. (Eds.), The art and science of entrepreneurship. Cambridge, MA: Ballinger, 273-331.
48. Zahra, S. & Covin, J. (1993). Business strategy, technology policy and firm performance. Strategic Management Journal, **14**, 451-478.

Exhibit – 1

Strategic Planning Items

Does your company prepare a written long-range plan covering more than one year?

If yes, please specify what time period the plan does cover.

Does your long range plan include:

- Quantified objectives?
- Pro forma financial statements?
- Budgets?
- Attempt to identify environmental factors?
- Procedures for detecting differences between plan and actual performance?

Informal Planning Item

Is any informal (not written) long-range planning done in your business?

Operational Planning Items

Please indicate to what extent each of the following activities is part of your business:

- Economic forecasting
- Analyzing target customers
- Analyzing major products
- Determining advertising needs
- Tax planning
- Estimating borrowing needs
- Employee benefit and compensation forecasts
- Reviewing labor costs
- Assessing personnel capabilities
- Reviewing employee performance standards
- Estimating personnel needs
- Analyzing job satisfaction
- Analyzing training needs
- Reviewing current inventory
- Monitoring stock safety levels
- Reviewing order placement and receiving
- Analyzing inventory size
- Reviewing storage needs
- Estimating dollar sales volume
- Setting sales targets
- Determining sales break-even

Technology Policy Items

Please indicate the extent to which your firms engages in the following:

- Policy to consider most up-to-date technology available
- Policy for going ahead with new processing equipment
- Tradition of being first to try new methods
- Plan to increase R&D spending

- Plan for new product development
- Resources for experimentation with new equipment
- Plan for recruitment of best available personnel in engineering and production
- Plan form recruitment of best marketing personnel
- Development projects based on ideas from technical staff in R&D and production
- Tradition of trying new equipment from suppliers
- Current capability in terms of qualified operations personnel
- Operations people have a big say in critical decisions
- R&D signs on all important development projects
- Operations personnel sign on all important development projects
- Policy for technological forecasting

Uncertainty Items

Please indicate the extent to which these factors cause uncertainty for management in your company:

- The suppliers of parts, raw materials, or merchandise
- The suppliers of equipment/technology
- The supply of labor
- Distributors of your products/services
- Actual users of your products/services
- Competitors for your supply of raw materials/merchandise
- Competitors for your customers
- Government regulations controlling your industry
- The public's political views and attitudes toward your industry
- Your firm's relationship with unions
- Keeping up with technological requirements in your industry in the production of goods/providing services
- Improving and developing new products/services by implementing new technological advances in your industry

Table 1
Correlation Matrix

| Correlation Matrix | Sales growth | Income growth | ROI | Market Share | Operational Plan | Tech Policy | Degree Formal | Uncertainty |
|--------------------|--------------|---------------|------|--------------|------------------|-------------|---------------|-------------|
| Sales growth | 1.00 | | | | | | | |
| Income growth | .59 | 1.00 | | | | | | |
| ROI | .49 | .80 | 1.00 | | | | | |
| Market share | .71 | .57 | .51 | 1.00 | | | | |
| Operational Plan | .23 | .24 | .30 | .34 | 1.00 | | | |
| Tech Policy | .36 | .35 | .36 | .45 | .57 | 1.00 | | |
| Degree Formal | .14 | .10 | .17 | .17 | .54 | .40 | 1.00 | |
| Uncertainty | .11 | .07 | .16 | .21 | .14 | .31 | .12 | 1.00 |

113 observations were used in this computation.
37 cases were omitted due to missing values.

Table – 2
ANOVA Results
Formal and Informal Planning with Firm Performance

ANOVA Table for Sales growth

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|------------------------------|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | 3.89 | 3.89 | 4.36 | .0389 |
| Informal Plan | 1 | 5.54 | 5.54 | 6.22 | .0140 |
| Written Plan * Informal Plan | 1 | .89 | .89 | .99 | .3206 |
| Residual | 119 | 106.08 | .89 | | |

Means Table for Sales Growth
Effect: Written Plan * Informal Plan

| | Count | Mean | Std. Dev. | Std. Err. |
|----------|-------|------|-----------|-----------|
| Yes, yes | 48 | 4.02 | .91 | .13 |
| Yes, no | 32 | 3.69 | 1.03 | .18 |
| No, yes | 36 | 3.78 | .90 | .15 |
| No, no | 7 | 3.00 | 1.00 | .38 |

ANOVA Table for Income growth

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|------------------------------|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | 2.01 | 2.01 | 1.86 | .1755 |
| Informal Plan | 1 | .82 | .82 | .75 | .3872 |
| Written Plan * Informal Plan | 1 | .01 | .01 | .01 | .9141 |
| Residual | 119 | 128.79 | 1.08 | | |

Means Table for Income growth
Effect: Written Plan * Informal Plan

| | Count | Mean | Std. Dev. | Std. Err. |
|----------|-------|------|-----------|-----------|
| Yes, yes | 48 | 3.83 | 1.08 | .16 |
| Yes, no | 32 | 3.59 | 1.16 | .21 |
| No, yes | 36 | 3.47 | .88 | .15 |
| No, no | 7 | 3.29 | .95 | .36 |

ANOVA Table for ROI

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|------------------------------|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | 3.14 | 3.14 | 2.73 | .1009 |
| Informal Plan | 1 | .08 | .08 | .07 | .7876 |
| Written Plan * Informal Plan | 1 | .16 | .16 | .14 | .7106 |
| Residual | 117 | 134.43 | 1.15 | | |

Means Table for ROI**Effect: Written Plan * Informal Plan**

| | Count | Mean | Std. Dev. | Std. Err. |
|----------|-------|------|-----------|-----------|
| Yes, yes | 46 | 3.63 | 1.00 | .15 |
| Yes, no | 32 | 3.66 | 1.18 | .21 |
| No, yes | 36 | 3.31 | 1.06 | .18 |
| No, no | 7 | 3.14 | 1.07 | .40 |

ANOVA Table for Market share

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|------------------------------|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | 5.21 | 5.21 | 6.36 | .0130 |
| Informal Plan | 1 | 6.01 | 6.01 | 7.34 | .0077 |
| Written Plan * Informal Plan | 1 | 1.38 | 1.38 | 1.68 | .1970 |
| Residual | 118 | 96.64 | .82 | | |

Means Table for Market share**Effect: Written Plan * Informal Plan**

| | Count | Mean | Std. Dev. | Std. Err. |
|----------|-------|------|-----------|-----------|
| Yes, yes | 48 | 3.83 | .91 | .13 |
| Yes, no | 32 | 3.53 | 1.08 | .19 |
| No, yes | 35 | 3.57 | .70 | .12 |
| No, no | 7 | 2.71 | .95 | .36 |

Table – 3
ANCOVA Results - Formal and Informal Planning with Technology Policy

ANOVA Table for Sales growth

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|--|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | .02 | .02 | .03 | .8737 |
| Informal Plan | 1 | .16 | .16 | .20 | .6546 |
| Tech Policy | 1 | 2.47 | 2.47 | 3.19 | .0769 |
| Written Plan * Informal Plan | 1 | .01 | .01 | .01 | .9359 |
| Written Plan * Tech Policy | 1 | .01 | .01 | .02 | .8911 |
| Informal Plan * Tech Policy | 1 | .12 | .12 | .15 | .6996 |
| Written Plan * Informal Plan * Tech Policy | 1 | .56 | .56 | .72 | .3967 |
| Residual | 104 | 80.49 | .77 | | |

ANOVA Table for Income growth

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|--|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | .01 | .01 | .01 | .9417 |
| Informal Plan | 1 | .42 | .42 | .42 | .5206 |
| Tech Policy | 1 | 1.15 | 1.15 | 1.13 | .2903 |
| Written Plan * Informal Plan | 1 | .06 | .06 | .06 | .8120 |
| Written Plan * Tech Policy | 1 | .31 | .31 | .31 | .5809 |
| Informal Plan * Tech Policy | 1 | .04 | .04 | .04 | .8513 |
| Written Plan * Informal Plan * Tech Policy | 1 | .01 | .01 | .01 | .9331 |
| Residual | 104 | 105.48 | 1.01 | | |

ANOVA Table for ROI

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|--|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | .06 | .06 | .06 | .8143 |
| Informal Plan | 1 | 1.45E-6 | 1.45E-6 | 1.30E-6 | .9991 |
| Tech Policy | 1 | 1.75 | 1.75 | 1.57 | .2133 |
| Written Plan * Informal Plan | 1 | .05 | .05 | .05 | .8274 |
| Written Plan * Tech Policy | 1 | .04 | .04 | .04 | .8479 |
| Informal Plan * Tech Policy | 1 | .03 | .03 | .03 | .8626 |
| Written Plan * Informal Plan * Tech Policy | 1 | .05 | .05 | .04 | .8409 |
| Residual | 103 | 115.00 | 1.12 | | |

ANOVA Table for Market share

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|--|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | .16 | .16 | .22 | .6373 |
| Informal Plan | 1 | .53 | .53 | .76 | .3856 |
| Tech Policy | 1 | 1.98 | 1.98 | 2.84 | .0948 |
| Written Plan * Informal Plan | 1 | 1.96E-3 | 1.96E-3 | 2.81E-3 | .9578 |
| Written Plan * Tech Policy | 1 | .05 | .05 | .08 | .7804 |
| Informal Plan * Tech Policy | 1 | .05 | .05 | .07 | .7903 |
| Written Plan * Informal Plan * Tech Policy | 1 | .33 | .33 | .48 | .4911 |
| Residual | 103 | 71.84 | .70 | | |

Table - 4
ANCOVA Results - Formal and Informal Planning with Operational Planning

ANOVA Table for Sales growth

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | 3.55 | 3.55 | 3.88 | .0515 |
| Informal Plan | 1 | 7.72 | 7.72 | 8.45 | .0045 |
| Operational Planning | 1 | .02 | .02 | .02 | .8971 |
| Written Plan * Informal Plan | 1 | 3.45 | 3.45 | 3.78 | .0547 |
| Written Plan * Operational Plan | 1 | 1.02 | 1.02 | 1.12 | .2931 |
| Informal Plan * Operational Plan | 1 | 2.45 | 2.45 | 2.68 | .1047 |
| Written Plan * Informal Plan * Operational... | 1 | 1.05 | 1.05 | 1.15 | .2863 |
| Residual | 104 | 95.09 | .91 | | |

ANOVA Table for Income growth

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | .17 | .17 | .17 | .6822 |
| Informal Plan | 1 | .49 | .49 | .49 | .4844 |
| Operational Planning | 1 | 3.22 | 3.22 | 3.24 | .0750 |
| Written Plan * Informal Plan | 1 | .03 | .03 | .03 | .8718 |
| Written Plan * Operational Plan | 1 | .04 | .04 | .04 | .8460 |
| Informal Plan * Operational Plan | 1 | .02 | .02 | .02 | .8911 |
| Written Plan * Informal Plan * Operational... | 1 | 1.56 | 1.56 | 1.57 | .2127 |
| Residual | 104 | 103.48 | .99 | | |

ANOVA Table for ROI

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | .12 | .12 | .11 | .7354 |
| Informal Plan | 1 | 404E-3 | 404E-3 | 394E-3 | .9501 |
| Operational Planning | 1 | 7.13 | 7.13 | 6.94 | .0097 |
| Written Plan * Informal Plan | 1 | .07 | .07 | .07 | .7941 |
| Written Plan * Operational Plan | 1 | .07 | .07 | .07 | .7880 |
| Informal Plan * Operational Plan | 1 | .13 | .13 | .13 | .7196 |
| Written Plan * Informal Plan * Operational... | 1 | 2.24 | 2.24 | 2.18 | .1426 |
| Residual | 104 | 104.67 | 1.03 | | |

ANOVA Table for Market Share

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|-----|----------------|-------------|---------|---------|
| Written Plan | 1 | 1.77 | 1.77 | 2.28 | .1340 |
| Informal Plan | 1 | 5.70 | 5.70 | 7.33 | .0079 |
| Operational Planning | 1 | 2.51 | 2.51 | 3.23 | .0752 |
| Written Plan * Informal Plan | 1 | 2.26 | 2.26 | 2.90 | .0914 |
| Written Plan * Operational Plan | 1 | .31 | .31 | .40 | .5281 |
| Informal Plan * Operational Plan | 1 | .88 | .88 | 1.13 | .2904 |
| Written Plan * Informal Plan * Operational... | 1 | .01 | .01 | .02 | .8906 |
| Residual | 103 | 80.04 | .78 | | |

Table – 5
Regression Results
Degree of Formal Planning, Plan in Years, Operational Planning and Technology Policy
With Firm Performance

Regression Summary
Sales growth vs. 5 Independents

| | |
|--------------------|-----|
| Count | 82 |
| Num Missing | 68 |
| R | .39 |
| R Squared | .16 |
| Adjusted R Squared | .10 |
| RMS Residual | .90 |

Regression Coefficients
Sales growth vs. 5 Independents

| | Coefficient | Std. Error | Std. Coeff. | t-Value | P-Value |
|------------------|-------------|------------|-------------|---------|---------|
| Intercept | 3.602 | .767 | .3602 | 4.694 | <.0001 |
| Degree Formal | .063 | .169 | .044 | .372 | .7110 |
| Plan Years | -.047 | .048 | -.108 | -.981 | .3296 |
| Operational Plan | -.053 | .149 | -.046 | -.358 | .7211 |
| Tech Policy | .426 | .130 | .416 | 3.291 | .0015 |
| Uncertainty | -.009 | .100 | -.010 | -.091 | .9281 |

Regression Summary
Income growth vs. 5 Independents

| | |
|--------------------|------|
| Count | 82 |
| Num Missing | 68 |
| IRI | .38 |
| R Squared | .14 |
| Adjusted R Squared | .09 |
| RMS Residual | 1.02 |

Regression Coefficients
Income growth vs. 5 Independents

| | Coefficient | Std. Error | Std. Coeff. | t-Value | P-Value |
|------------------|-------------|------------|-------------|---------|---------|
| Intercept | 2.706 | .869 | 2.706 | 3.114 | .0026 |
| Degree Formal | .184 | .191 | .114 | .963 | .3385 |
| Plan Years | -4.649E-4 | .054 | -.001 | -.009 | .9931 |
| Operational Plan | .158 | .169 | .122 | .934 | .3530 |
| Tech Policy | .280 | .147 | .243 | 1.912 | .0597 |
| Uncertainty | -.018 | .113 | -.017 | -.157 | .8755 |

Regression Summary
ROI vs. 5 Independents

| | |
|--------------------|-----|
| Count | 80 |
| Num Missing | 70 |
| IRI | .40 |
| R Squared | .16 |
| Adjusted R Squared | .10 |
| RMS Residual | .95 |

Regression Coefficients
ROI vs. 5 Independents

| | Coefficient | Std. Error | Std. Coeff. | t-Value | P-Value |
|------------------|-------------|------------|-------------|---------|---------|
| Intercept | 3.528 | .874 | 3.528 | 4.038 | .0001 |
| Degree Formal | .017 | .189 | .011 | .091 | .9276 |
| Plan Years | -.037 | .051 | -.081 | -.721 | .4729 |
| Operational Plan | .295 | .159 | .244 | 1.856 | .0674 |
| Tech Policy | .231 | .145 | .213 | 1.592 | .1157 |
| Uncertainty | .080 | .114 | .080 | .705 | .4832 |

Regression Summary
Market share vs. 5 Independents

| | |
|--------------------|-----|
| Count | 81 |
| Num Missing | 69 |
| IRI | .49 |
| R Squared | .24 |
| Adjusted R Squared | .19 |
| RMS Residual | .88 |

Regression Coefficients
Market share vs. 5 Independents

| | Coefficient | Std. Error | Std. Coeff. | t-Value | P-Value |
|------------------|-------------|------------|-------------|---------|---------|
| Intercept | 3.438 | .753 | 3.438 | 4.563 | <.0001 |
| Degree Formal | .037 | .166 | .025 | .224 | .8232 |
| Plan Years | -.023 | .047 | -.051 | -.482 | .6311 |
| Operational Plan | .117 | .148 | .097 | .789 | .4323 |
| Tech Policy | .439 | .127 | .416 | 3.462 | .0009 |
| Uncertainty | .111 | .098 | .118 | 1.131 | .2617 |