

**PROFITABILITY AND INFORMATION TECHNOLOGY CAPITAL INTENSITY
IN THE INSURANCE INDUSTRY**

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ABSTRACT

The relationship between profitability and information technology expenditures are studied in forty insurance companies that are systems technology leaders. The results show that: (1) the most profitable firms are more likely to spend a significantly higher proportion of their non-interest operating expense on information technology, and (2) the least profitable firms are more likely to spend a significantly smaller proportion of their non-interest operating expense on information technology. The odds are very high, at least ninety-seven percent (97%) that the most profitable firms will not rank in the lowest quartile in terms of information technology capital intensity.

INTRODUCTION

Does insurance company performance depend on the level of information technology investment? Understanding the potential differential economic effects of information technology (IT) capital has reached strategic importance in the insurance industry. In 1986, U.S. insurance companies spent over \$6 billion on systems technology-- defined as hardware, software, peripherals and data communications equipment. The high level of capital invested in information technology reflects the need to deliver flexible investment-based products at the lowest effective costs.

With the emergence of banks (e.g. Citicorp, First Wachovia, Security Pacific, etc.) and non-bank financial institutions (e.g. American Express, Sears, etc.) as potentially potent competitors, the insurance industry is under-going fundamental structural change [2]. Insurance companies are now selling a diverse array of financial products to customers that are more demanding and sophisticated than ever. These new products have shorter life-cycles and are more complex than traditional insurance products; and as they mature, they are being replaced with products with similar characteristics.

Increasingly, product innovation in the industry is heavily dependent on information technology for production efficiency, and for distribution and service effectiveness. Because technology is altering the way companies compete, there is increased incentive to examine closely the link between the business strategy of the firm and the information technology strategy. The potential risks, as well as the potential rewards, associated with investments in information technology may be accelerating. For example, companies that are slow to introduce new products may find that they have to concede market control, acceptable levels of market share, and even product profitability.

Evaluating whether a firm's level of investment in information

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technology is sufficient (or insufficient), or represents a competitive edge, has been problem historically for top management. Part of the difficulty has been: (1) the lack of competitive information on a sufficient number of firms, and (2) the lack of agreement between business persons and academics on the appropriate measures to study information technology effects. It is important to compare firms within an industry segment to highlight the best practices in the industry and promote their adoption.

STUDY HYPOTHESIS

The most profitable firms will invest significantly more in IT capital than the least profitable firms.

THE LOMA CAPITAL INVESTMENT DATA BASE

This study was motivated by a desire to help insurance companies better evaluate their investments in information technology. Our source of data for the study is the Life Office Management Association (LOMA) Information Technology Capital Investment database. The database captures premium income by line of business, firm level operating expenses by product category (e.g. life versus property and casualty), and systems technology sophistication.

Systems technology sophistication in insurance companies is assessed using a model of the types of data processing installations. The model was formulated by an industry panel of senior information system executives. In this model, the columns correspond to five levels of systems technology sophistication. The rows are used to characterize the levels on five dimensions: (1) hardware environment, (2) operations, (3) systems software, (4) applications software, and (5) management. Each firm self-types their data processing installation based on the definitions that are supplied with the survey instrument.

Annually, LOMA disguises and summarizes the information in the Capital Investment database before making it available to member companies. The database documents the investment decisions of each

company and tracks key financial indicators.

BACKGROUND INFORMATION

This study examines the information technology budgetary expenditures of forty (40) insurance companies in the LOMA Capital Investment Data Base. Each of the forty firms are represented in data base for the full four year period, 1983-1986. The forty companies constitute the sample universe for this study. These companies are industry leaders in the deployment of state-of-the-art hardware and software technology. Table 1 characterizes the system technology sophistication in the each of the firms in the forty firm LOMA universe.

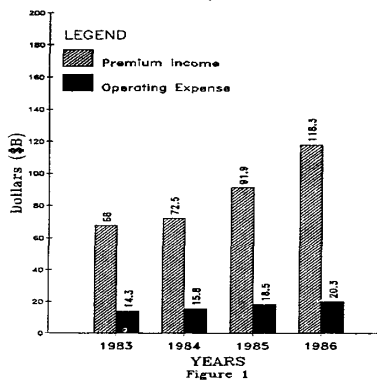
Table 1. Systems Technology Sophistication
Forty Firm LOMA Universe

Hardware	Multiple processors/multiple locations directly connected or via switched network
Operational	Database management system, TSO, CICS remote and local batch
Systems Software	Multiple cpu's/multiple program execution multiple operational environments
Application Software	Modular programs/structured techniques high level language
Management	Multiple locations/dissimilar operations remote control

Sample Profile

Figure 1 provides a profile of both Premium Income and Non-interest Operating Expense for the forty firm LOMA universe, 1983-1986.

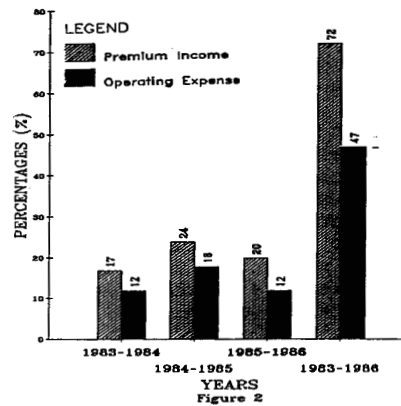
Premium Income Vs. Operating Expense
Forty Firm LOMA Universe



Ranking the firms by Premium Income and dividing them into quintiles (lowest 20%, second 20%, third 20%, fourth 20%, and highest 20%) yields the results shown in Table 2. In 1983, the Premium Income of the firms in the lowest quintile averaged \$127.1 million with the range varying from \$51 million for the smallest firm in the LOMA universe to \$255 million. For this quintile, the average Non-interest Operating Expense was \$28.6 million and the average amount spent on Information Technology was \$4.2 million. The Premium Income of the average firm in the highest quintile was \$5.4 billion, Non-interest Operating Expense was \$1.2 billion, and the IT expense was \$132.9 million. The Premium Income for the firms in this quintile ranged from \$2.4 billion for the smallest firm to \$10.8 billion for the largest firm in the forty firm universe.

For 1986, Premium Income ranged from \$72 million for the smallest firm to \$17.3 billion for the largest firm in the LOMA universe. The Premium Income of the firms in the lowest quintile ranged from \$72 million to \$376 million. In this quintile, Premium Income averaged \$197.2 million, Non-interest Operating Expense was \$44.8 million and Information Technology expense was \$7.4 million. For the highest quintile, Premium Income ranged from \$4.8 billion to \$17.3 billion. The Premium Income of the firms in the quintile averaged \$9.5 billion, Non-interest Operating Expense was \$1.7 billion and Information Technology expense was \$190.8 million.

Premium Income Growth Vs. Operating Expense Growth
Forty Firm LOMA Universe



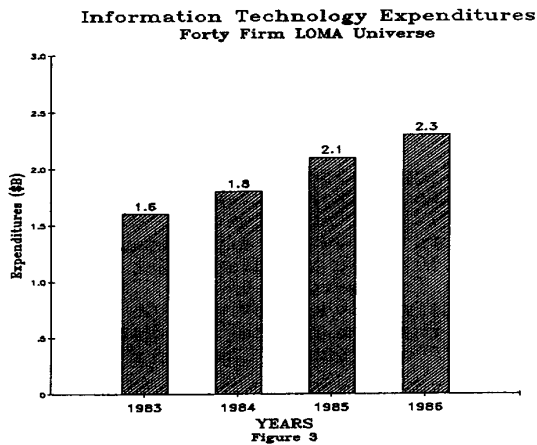
In 1986, the forty company LOMA universe reflected; 10 out of the top twenty, 18 out of the top 50, and 23 out of the top 100, leading Life Insurance companies in Premium Income [A.M. Best Management Report, 1987]. Between 1983 and 1986, total Premium Income for the LOMA universe increased by 72% from \$68.1 billion to \$118.3 billion. The premium income on life products increased by 69%. During the same time period, Premium Income for the Life industry increased by 68% [A.M. Best Management Report, 1987]. As a result, we calculate that the forty firm LOMA universe generated approximately 38% of the Premium Income in the Life industry.

Figure 2 shows the change in both Premium Income and Non-interest Operating Expense for the LOMA universe between 1983 and 1986. Non-interest Operating Expenses grew from \$14.3 billion to \$20.3 billion dollars, reflecting a 47% increase.

Table 2. Comparison of Premium Income, Operating Expense, and IT Expense Averages
1983 vs. 1986

Year	Premium Income Range	Premium Income	Operating Expense	IT Expense
1983	\$ 51M - \$ 255M	\$ 127.1M	\$ 28.6M	\$ 4.2M
	303 - 617	465.4	105.6	10.6
	638M - 1.1B	836.4	128.5	19.5
	1.2B - 2.3B	1.6B	355.5	34.4
	2.4 - 10.8	5.4	1.1B	132.9
1986	\$ 72M - \$ 376M	\$ 197.2M	\$ 44.8M	\$ 7.4M
	394 - 916	697.2	157.0	18.2
	1.0B - 1.6B	1.4B	197.8	30.8
	1.7 - 4.3	2.8	390.1	47.9
	4.8 - 17.3	9.5	1.7B	190.8

Indirect Operating Expenses, which are Non-interest Operating Expenses minus expenses for Information Technology, increased by 41%. The firms in the study spent \$1.6 billion on Information Technology in 1983 and \$2.3 billion in 1986. This represents a 46% growth in Information Technology expenditures. We believe that the growth differential between Indirect Expenses and Information Technology expenditures represents a transfer of work to automated systems. Information Technology expenditures are shown in Figure 3.



One of the most useful measures of insurance company productivity and profitability is the ratio of Non-interest Operating Expense to Premium Income, or the Operating Expense ratio. Using this measure of productivity and profitability, insurance companies with similar lines of business can be compared. Simply put, any company that consistently operates with expenses per dollar of income that are higher than the competition is at a competitive disadvantage.

In 1983, the average Operating Expense ratio in the forty company LOMA universe was .21 versus .19 in 1986. Overall, the average firm in the LOMA universe improved its profitability position (Operating Expense ratio decreased) by 9.7% between 1983 and 1986. These results differ by line of business. For example, The Operating Expense ratios of companies that sell Ordinary, or Ordinary and Group insurance are lower than the industry average; are about average

for those firms that sell Ordinary, Group, and Credit or Ordinary, Group, and Property and Casualty; and are higher than the average for those that sell Ordinary, Industrial, Group, Credit, and Property and Casualty. In 1986, there was one firm in the forty firm LOMA universe that sold Ordinary insurance; eighteen that sold Ordinary and Group; one firm that sold Ordinary, Group, and Credit; fifteen that sold Ordinary, Group, and Property and Casualty; and five that sold some other combination of Ordinary, Industrial, Group, Credit, and Property and Casualty. Because of the limited number of firms in this analysis, and the limited space, we will not concentrate on the individual line of business results. However, we will discuss the direction of the findings, where possible, for firms that sell Ordinary and Group insurance; and for firms that sell Ordinary, Group, and Property and Casualty.

As a measure of capital intensity in Information Technology we will rely on the ratio of Information Technology expenses to Non-interest Operating Expenses (Information Technology Expense ratio). In 1983, the IT Expense ratio for the forty firm LOMA universe was .13 versus .15 in 1986. This reflects a 15% increase in the overall level of IT capital intensity in the LOMA universe.

Do most firms improve their profitability? Seventy-five (75%) percent of the firms in the LOMA universe improved their profitability position--the Operating Expense ratio decreased--between 1983 and 1986. Fifty percent of the firms improved their profitability position by more than the overall average (9.7%) for the LOMA universe.

The growth in efficiency (1983-1986 change in the Operating Expense ratio) averages a significant 2.4% per year. Twenty-five percent of the firms improved their profitability by more than 20%, and twenty percent of the firms improved their profitability position by more than 30%. Fifteen (15%) percent of the firms experienced a profitability decline (the Operating Expense ratio increased) of more than 10%, and five (5%) percent of the firms had

a drop of more than 20%.

The firms that had above average improvements in their profitability position, typically finished 1986 with an Operating Expense ratio that was significantly lower (better) than the industry average (.19). Though the results are inconsistent, the firms with the biggest improvements in their profitability position started 1983 with a profitability position at or higher (worse) than the industry average. In fifty percent (50%) of the firms, the profitability ratio changed by ten percentage points or less. Thus projections that future profitability ratios will be about the same as historicals is a reasonable forecast without significant changes in business strategy or the competitive environment.

STUDY FINDINGS

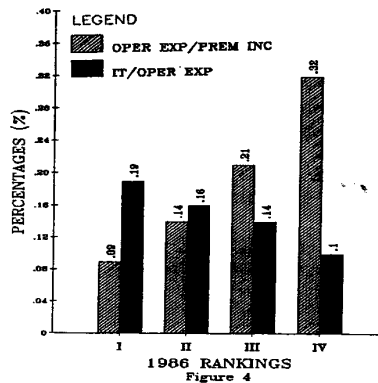
What Is the Relationship Between the Profitability of the Firm and the Level of Capital Intensity in Information Technology?

To address this question, the firms were ranked using the Operating Expense ratio and sub-divided into quartiles (Group I represents the lowest 25% of the firms, Group II the second lowest 25%, Group III the third lowest 25%, and Group IV the highest 25%). The results in Figure 4 show that most profitable firms (Group I) invested the most ("aggressive investors") in Information Technology per dollar of Non-interest Operating Expense. The least profitable firms (Group IV) invested significantly less as a proportion of their Non-interest Operating Expense ("conservative investors"). We believe that the top performers (Group I firms) are realizing significant differential economic effects from their level of capital intensity in IT. In general, Group IV firms are at a competitive disadvantage because of the high ratio of operating expense to premium income.

Specifically, in 1986 the Operating Expense ratio in the most profitable firms (Group I) was .09 versus .32 in the least profitable firms (Group IV). Using this as the basis of comparison, the profitability differential between Group I and Group IV firms was 255%. In addition, on the average

the most profitable firms ("aggressive investors") exhibited the highest level of Information

Operating Expense to Premium Income
Vs.
IT To Operating Expense



Technology capital intensity (.19), while the least profitable firms (Group IV) or "conservative investors", invested significantly less (.10). We calculate that the capital intensity of the "aggressive investors" was 90% higher than the capital intensity of the "conservative investors".

Table 3 shows that in 1986, Premium Income averaged \$3.8 billion for the top performers (Group I) versus \$1.9 billion for firms with the lowest profitability (Group IV). However, Non-interest Operating Expense for Group IV firms averaged \$619 million versus only \$318 million for Group I firms. In terms of Information Technology

Table 3. Comparison of Premium Income, Operating Expense, and IT Expense Averages for 1986

Quartiles	Premium Income	Operating Expense	IT Expense
I	\$ 3.8B	\$ 318.8M	\$ 61.1M
II	2.9	440.1	61.9
III	3.1	660.4	75.4
IV	1.9	619.6	37.7

expenditures, the expenses for Group I firms averaged \$61.1 million versus \$37.7 million for Group IV firms.

Similarly, in 1983, the Operating Expense ratio of the most profitable firms was .10 versus .32 for the lowest performers. We calculate that the profitability differential between Group I and Group IV firms was 220%. The

Information Technology Expense ratio was .15 for the "aggressive investors" (Group I) versus only .09 for the "conservative investors" (Group IV). The IT capital investment differential between the two groups shows that the "aggressive investors" were investing more heavily (67%) in IT capital per dollar of operating expense than "conservative investors". Premium Income averaged \$1.2 billion for Group I firms versus \$1.4 billion for Group IV firms. However, Non-interest Operating Expenses for Group IV firms averaged \$782 million versus only \$137 million for Group I firms. In terms of Information Technology expenditures, the budget for Group I firms averaged \$22 million versus \$37 million for Group IV firms.

Likelihood Analysis

Aggregating the data for the four year period, table 4 shows the percent of firms in each performance quartile for the Operating Expense ratio and the Information Technology Expense ratio. For Group I firms, or firms with the lowest Operating Expense ratio, the odds are 45% or more that the firms rank in the top (highest) quartile on the amount spent on Information Technology per dollar of Operating Expense. The odds are at least 72% that the firms rank in the top fifty percentile on the IT Expense ratio.

Conversely, the odds are less than 3% that the most profitable firms rank in the lowest quartile on the Information Technology Expense ratio; and less than 28% that the firms rank in the bottom fifty percentile.

For the least profitable firms, there is a 10% chance or less that the firms rank in the top quartile on the Information Technology Expense ratio; and a 15% chance or less that the firms rank in the top fifty percentile. The odds are at least 65% that the firms rank in the lowest quartile on the IT Expense ratio. These odds are sensitive to the lines of business that a firm sells. For example, the odds are more extreme than those stated for firms that sell Ordinary, Group, and Property and Casualty insurance; and less extreme for those that sell only

Table 4
 Operating Expense Ratio
 Vs.
 IT Expense Ratio
 Quartile Ranking Comparisons
 Percent of Firms
 1983-1986
 Operating Expense Ratio

Quartiles	I	II	III	IV
I	2.5%	5%	27.5%	65%
II	25	25	30	20
III	27.5	35	32.5	5
IV	45	35	10	10

Ordinary and Group. In a strict scientific sense, these results do not establish the direction of causality between profitability and information technology capital intensity. However, the findings do suggest very clear and strong empirical relationships that do make intuitive sense, though they may not be necessary conditions.

CONCLUSIONS

The extent to which insurance companies understand the potential differential economic effects of information technology capital will be a key factor in their ability to successfully compete. The ability to deliver flexible investment based products at the lowest effective costs has become a critical success factor for the industry. Product innovation in the industry is heavily dependent on information technology as a driving factor in production, distribution, and service. The extent to which insurance firms understand their costs and profitability parameters will be critical if they are to invest successfully in information technology.

Though we did not establish causality between profitability (Operating Expense ratio) and Information Technology capital intensity (IT Expense ratio), the relationships we found are significant. These results show that:

- (1). The most profitable firms, or top performers, are more likely to spend a significantly higher

proportion of their Non-interest Operating Expense on Information Technology.

(2). The least profitable firms are more likely to spend a significantly smaller proportion of their Non-interest Operating Expense on Information Technology.

The differential between Group I and Group IV firms on both the Operating Expense ratio and the IT Expense ratio widened between 1983 and 1986. During this period, firms in Group I improved their profitability position by one percentage points (.10 vs. .09). Conversely, firms in Group IV had a three percentage point decline in their profitability position. In addition, the high level of IT capital intensity in Group I firms is associated with a high level of proprietary software development.

The most profitable firms are demonstrating peak performance by controlling operating expenses. The odds are very high, at least 97%, that a top performing company will not rank in the lowest quartile in terms of the IT expense ratio; and the odds are at least 72% that the company will rank in the top fifty percentile. Conversely, low levels of profitability are related to low levels of Information Technology capital intensity. The odds are 15% or less that one of the least profitable firms will rank in the top fifty percentile on the IT Expense ratio. In general, average levels of IT capital intensity are closely related with average profitability performance. The findings suggests that low profitability firms (high Operating Expense ratio) are at greater risks with low levels of IT capital intensity than high profitability firms with high levels of capital intensity. In addition, when the technology fits the organizational situation, significant savings in operating costs are possible.

Can more capital buy improved profitability? It cannot be universally determined from our study whether or not low profitability performers can improve their position through simply higher levels of information technology capital investment.

However, the evidence suggests that the possibility of improvement is likely with higher levels of investment, assuming that Indirect Operating Expenses can be brought under control. The question is a difficult one because of the need to consider simultaneously the firm's overall business and product strategy position. Each business situation of this type should be evaluated on its own merits.

In general, these results hold regardless of the lines of business that the insurance companies sell. However, the magnitude of the profitability differential between the most profitable and the least profitable firms, and the relationship with IT capital intensity are dependent on the lines of business that the firms offer.

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