

**MEASURING BUSINESS VALUE FOR
INVESTMENTS IN POINT-OF-SALE TECHNOLOGY**

by

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1. Introduction

Point-of-sale (POS) debit card terminals are currently being installed at an increasing number of gasoline service stations around the country. Based on a recent study by Carmody and Co., Inc., a consulting firm which specializes in retail payment technology management, POS terminals deployed at service stations numbered approximately 5,500 in 1986, and are expected to increase to 14,200 by 1990 [2]. If convenience stores (i.e., grocery stores that serve gas) are also included, the number of installed POS terminals was 6,900 two years ago and will be about 24,200 by 1990.

Benefits from POS technology are derived by all players in the gasoline service station business. POS terminals permit customers to make convenient *cashless* payments for their gasoline purchases by swiping a debit card through a card reader and entering their personal identification number. This results in a *paperless* transaction at the service station, replacing checks and credit card receipts, which in turn frees the gasoline retailer to concentrate on running the business more effectively. Oil companies view these transactions as nearly *riskless*, since approval to debit the customer's bank account is received before gas is pumped. They are also *float-free*, since the company's bank account is credited immediately upon debit approval. Banks benefit from fees received from the use of their networks, and the efficiencies involved in processing entirely electronic transactions.

Many of the benefits from POS terminals are readily measured. An oil company's reserves for bad debt related to check and credit card payments, plus the corresponding float costs on approximately 10 days of outstanding receivables, can be added back to cashflow. The bank's network usage income can be computed as a direct function of the number of debit card transactions.

But how can the improved operating effectiveness of a paperless service station be computed? To what extent does the convenience of customers' cashless payments translate into increased market share for the service station and/or the oil company? And, how significant is the presence of POS terminals compared to the price of gasoline, the station's location and its service capabilities, the traditional variables used to estimate market share? All of these are questions for which oil company planners are seeking answers, as they contemplate the value of their investments in POS terminals.

2. Business Value Linkage Impact Analysis

The general situation that is developing in the market for POS debit services should be readily recognized by information systems managers who are responsible for large operating budgets. In fact, a recent Computerworld editorial asked a very similar question:

Can you imagine growing your information systems budget by nearly twice the projected rate of inflation without having the ability to adequately measure the business value of projects being funded?¹

¹Computerworld, December 5, 1988, p. 20.

In this paper we discuss a new approach to measuring the strategic impacts of information technology (IT) investments: business value linkage (BVL) impact analysis [1, 3, 4]. The approach is meant to provide answers to some of the basic questions most often asked by senior managers responsible for technology investments. For example, how do IT investments affect the operating costs, market shares and revenue streams of the firms which make them? When an IT investment changes the way a firm does business, how can the benefits be quantified?

The importance of developing better methods for IT performance evaluation was further stressed by the results of a recent survey by the Index Group. They found that "only 10% of 240 senior IS managers polled say they've found ways to sufficiently assess the business value of their information systems."² Without a means to readily quantify the *less tangible* impacts, managers may authorize millions of dollars of technology investments based on incomplete information. BVL impact analysis provides evidence that the right outputs are included in cost-benefit analysis, so that managers have a stronger basis from which to make key investment decisions. We illustrate the rudiments of the approach for investments in POS debit card technology at gasoline service stations. Our ideas are based on the results of a case study we are conducting to investigate how technology deployment decisions are made in gasoline retailing operations.

Business value linkage impact analysis was developed to measure hard-to-quantify payoffs from information technology investments. This assessment technique involves modeling a strategic output in terms of key features of the operating and competitive environments that determine a firm's ability to produce strategic, economic outputs. Strategic outputs, such as market share and revenue changes, labor savings, and changes in service quality, can be measured using data collected in the field.

Statistical evidence is then used to confirm or disconfirm hypothesized linkages between an IT investment, described in physical rather than dollar terms, and the strategic outputs. The idea of a business value linkage is an important one here because it represents the mechanics within the firm and its operating environment by which technology can create competitive leverage.

Carrying out a BVL impact analysis involves several phases:

1. Identifying business opportunity areas for economic impacts;
2. Defining business value linkages between an IT investment and its potential impacts;
3. Collecting data, constructing impact models and estimating them;
4. Interpreting the results and calculating dollar estimates or bounds on business value.

A brief overview of each phase is presented below for investments in gasoline service station POS terminals. The discussion is based on a case study we are conducting on the extent to which POS terminals can create strategic advantage, and how those gains should be quantified.

²Computerworld, November 28, 1988, p. 8.

3. BVL Impact Analysis for Investments in POS Technology

3.1. Measuring POS Impacts: Perceiving Business Opportunities

Assessing the business value of POS terminals initially requires that managers review the set of expectations they have regarding the business opportunity areas that POS terminals are likely to affect. Richard Norton, in an Index Group pamphlet on IT investment evaluation, used the term "strategic interlock," in order to stress the idea that performance evaluation should be as closely related to the strategic goals of a firm, as the initial technology investment was related to trying to achieve those strategic goals. Thus, it makes sense for senior managers who will review the results of a POS terminal deployment business value study to identify at the outset the broad outlines of how they perceive the technology should be affecting an oil company's gasoline retailing operation's performance. This should lay the foundation for conducting the study, and will help to identify the key people within the firm whose cooperation is necessary to make it a success.

3.2. Measuring POS Impacts: Business Value Output Identification

Next, project participants define in detail the set of potential business impacts that the investment in POS terminals is expected to have. This phase, when properly executed, requires a significant effort from line managers since key production processes must be carefully investigated to precisely define an appropriate business value linkage. Since statistical tests are used later to confirm or invalidate the proposed linkages, extra effort put into defining these linkages up front helps make analysis of the results more meaningful to managers.

Based on discussions we have had with managers in the oil and banking industries, and consultants who specialize in retail funds transfer, we have identified a number of potential economic impacts and underlying costs related to service station POS investments. The oil company's fixed costs cover the POS equipment and its installation, network membership fees, occupancy, and line charges. Variable costs include terminal maintenance and the costs of transaction processing. The sum of these fixed and variable costs constitutes the *total cost* of the POS investment. Using traditional methods of investment valuation, the total costs over time would be compared to the total tangible benefits, to arrive at some determination of whether the investment will pay off. This approach falters, particularly when there are substantial intangible benefits that are the real justification for the investment.

Four classes of economic outputs for POS occur at individual service stations:

- Float savings and reduction of bad debt;

- Retail gas sales and market share impacts;
- Improved in resource use;
- Increase in perceived service quality.

Our analysis looks at valuation from the perspective of an oil company. Note that each output is "hypothesized" to be related to the POS investment; we need evidence before we can state with confidence the extent to which changes in each varies with an oil company's investment in POS terminals. In addition each output is created in a somewhat different context: corporate cash management activities, the market for gasoline, service station operations and the perceptions of the local base of service station customers.

Float savings and the elimination of bad debt on all POS transactions constitute the most *direct benefit* resulting from the POS investment. Retail sales and market share improvements, changes in resource use, and increases in perceived service quality, even if they really do vary with POS investment, are not directly measurable, although they represent some of the oil company's desired strategic outcomes. Once quantified, using econometric techniques, these *indirect benefits* can be included in the computation of *total return* of the POS investment.

3.3. Measuring POS Impacts: Data, Model and Estimation

Once the business value linkage has been defined, data collection and the actual BVL impact analysis begins. This phase involves collecting data for the target IT variables, POS terminals in this case, along with descriptive data on other key factors contributing to the economic outcomes being analyzed. Econometric models are constructed to determine whether the statistical evidence supports hypotheses that POS terminals affect specific business results.

A simple impact analysis model for the service station market share might include the following variables:

$$\text{MARKET SHARE} = f(\text{GAS_PRICE}, \text{LOCATION_QUALITY}, \text{SERVICE_LEVELS}, \\ \text{BRAND_NAME}, \text{GAS_GRADE}, \text{CREDIT_CARDS}, \text{POS_TERMINAL})$$

where $f(\text{GAS_PRICE}, \dots, \text{etc.})$ is read "a function of GAS_PRICE, ..." and the other listed variables.

GAS_PRICE, for example, is a measure of the relative price levels of gas sold at competing stations. LOCATION_QUALITY captures the ease-of-access and relative traffic flows in the immediate neighborhood of the station. SERVICE_LEVELS describes the physical service facilities of the station in terms of a surrogate such as number of pumps or number of service bays. BRAND_NAME is a measure of the customer recognition of the parent owner, the oil company. GAS_GRADE is a measure of the perceived quality of a service station's product. CREDIT_CARDS measures the number of alternatives which customers have in making their gasoline purchase, in addition to cash or direct debit via POS, if it is available.

Of course, the POS_TERMINAL variable is of most interest here. It is included to see if a case can be made that the presence of a POS terminal actually affects the business value output in the model -- MARKET SHARE of gasoline sales in a competitive territory. If statistical evidence is found that MARKET SHARE carries with POS_TERMINAL deployment at stations, then we can make a case that our initial hypothesis about the existence of a business value linkage has merit.

3.4. Measuring POS Impacts: Business Value and Managerial Interpretation

The last phase of a BVL impact analysis attempts to validate the results of the analysis, and quantify the business value of the POS investment. Then, the results from the impact analysis model are used to estimate the dollar value, in market share leverage terms, for each POS terminal. Moreover, we can expand on the original analysis by examining the environmental and competitive conditions under which POS business value is maximized. This would allow managers to use BVL impact analysis results to enhance strategic planning for POS location, as well as create an historical baseline for business value.

4. Conclusion

A current instance of information technology appearing in the consumer marketplace is point-of-sale debit card terminals at gasoline service stations. Are POS terminals a strategic opportunity for major oil companies or (after "first mover advantages") will they become simply a requirement of "doing business" in the retail gasoline market? How can management best decide if the investment is worthwhile? Although this technology appears to contain benefits for all the participants, senior executives still may well question the business value impacts of investments in POS.

This paper has outlined a new approach to obtaining answers to these and related questions for measuring the business value of investments in IT. The approach is called business value linkage (BVL) impact analysis and we illustrate its application in the context of POS terminals. One advantage of BVL analysis is that it facilitates the quantification of less tangible benefits from IT by focusing on the intermediate production processes involved in delivering final outputs. Performing the analysis requires the direct and active participation of line managers in developing the model(s). Moreover, estimation of the key relations in the model allows management to validate the BVL impacts (if any) and to calibrate the benefits they can anticipate. Thus, the approach provides valuable input to the decision process for IT investments.

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