

The Financial Dynamics of Small Business
Growth and Survival

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ABSTRACT

The failure rate for small businesses is extremely high. Inadequate financial control is a major contributory factor. The pattern of interactions between a fluctuating sales rate and the levels of receivables, payables, inventory and cash is highly complex. A model is described which simulates the experience of a small business in managing current assets and liabilities. It demonstrates the way in which liquidity changes over the operating cycle, how cash flow and profit are dynamically different and how the firm's need for financing is constantly varying. System Dynamics is a useful tool for understanding and improving the financial management of small firms.

INTRODUCTION

This paper reports on a study where System Dynamics (S.D.) was used to understand the dynamics of cash flow and liquidity management as they affect the small business. A model is described which analyzes the impact of seasonal sales fluctuations on cash, receivables, inventory and payables. It researches the dynamics of cash flow management for a case study firm and shows the relation between observed behavior patterns and system structure.

Part two of this paper reviews the literature on financial management in small firms and points out that a number of authors are describing the sort of problems which System Dynamacists study. These are the problems of obtaining a satisfactory dynamic response from a complex system which is affected by environmental turbulence. A brief description of the model is also provided. The following section describes various runs which were used to understand the financial consequences of sales instability. Finally, the results are summarized and some directions for future research are suggested.

REVIEW OF LITERATURE

This section summarizes findings from previous research into financial management in small firms. It also provides a priori justification for using SD modelling techniques. The literature review highlights three themes. One is that small business failure is an important real world problem. Another is that small firms face quite distinct problems in managing their finances. Finally it is shown that many of the problems a small business faces can be attributed to financial instability and an inability to comprehend or control operating cycle dynamics.

It seems to be an implicit assumption in much business literature that differences between large and small firms are differences in degree rather than differences in kind. Welsh and White (1981a), however argue that "a small business is not a little big business". They stress the differences are especially important in the area of financial planning. The undercapitalization which typifies small firms exercises a pervasive effect on many decisions. Welsh and White identify the major threat to small business survival as being the 'cash flow illusion' - the idea that profitable sales growth will soon generate corresponding flows of cash. In practice this may simply never be realized. A growing firm tends to absorb all available cash with the result that adequate capitalization remains ephemeral and the manager must constantly guard against the dangers of insolvency.

The authors feel that the special problems of a small business can most usefully be viewed in a systems perspective.

The principle that cash flow equals net profit plus depreciation and amortization is correct for a system in perfect equilibrium Small businesses are seldom in equilibrium or near it. Even with uniform growth and earnings (it) is subject to very significant short term fluctuations compared to the overall cash flow ..
.. A small business must respond to large, often severe fluctuations in every aspect of the business.

Welsh and White, 1981a, pp. 23-26.

They also point out that external forces have a much greater impact on small firms. This implies that they must be managed in a flexible manner so that they are ready to respond to the vagaries of an uncertain environment. Additional problems are caused by seasonality. Typically, cash is consumed during periods of rapid growth and accumulates at other times. Few months' activities fall into the uniform cycle which an annual income statement suggests. In a related article (1981b), Welsh and White argue that the financial 'rules of the game' ought to be radically different for small firms. Rigid guidelines used to calculate financial performance and judge the firm's condition which are based on larger companies are inappropriate. There are, however, few clear ideas of how they should be judged.

Some evidence of the acute financial problems which confront small firms is provided by the large number which fail each year. The number is estimated to be around 400,000 annually (see for example Dunn and Bradstreet's Business Failure Record. There is also evidence that inadequate financial control is a major contributory factor to many failures. Weinstein (1982) cites a study which concluded that inadequate accounting information and standards are major causes of problems. Clute (1980) confirmed this by reviewing a sample of firms which sought SBA assistance. He found that some 40% were experiencing financial difficulties because of accounting problems. These included inadequate accounting records, a lack of cash flow and working capital analysis, and a general belief among owners that if the firm was earning a profit then cash flow would take care of itself.

There is also an impressive weight of informal evidence suggesting that experienced analysts can predict forthcoming difficulties from financial statements. Fox (1981) uses his extensive background in turning around small businesses

to identify signals which indicate that the firm is likely to encounter major difficulties. Most of these involve the businesses ability to manage working capital, including cash flow projection, rising levels of receivables and the problem of sudden changes in inventories. Fox is adopting a systems and control perspective by discussing levels (cash, receivables, inventory and payables) as well as the inflow and outflow rates which affect them. It also stresses maintaining control through a set of policies which can adequately respond to environmental fluctuation. The difficulty with Fox's 'model' is that it is a verbal one in which the interrelations between the various warning signs are not made explicit. The construction of a more formal model to illustrate and test these propositions seems worthwhile.

Edmunds (1979) suggests that a planning model for small businesses should focus on cash flow as the central variable. It should concentrate on working capital accounts and the likely impact of alternative cash collection and disbursement patterns. He also cites a study by Woodward which also stresses cash flow as the major focus of attention.

One of the weaknesses of small business is undue concentration on the income statement, especially in times of rapid growth. It is the capacity to expand within ones' available cash resources which ought to be considered by managers of small businesses.

Woodward, 1976, p. 113.

Belt (1979) points out that liquidity management is especially important for smaller businesses because they tend to be concentrated in wholesaling and retailing where current assets tend to be a greater proportion of total assets. This difficulty is then compounded by undercapitalization. In fact, a survey by Jones (1979) suggests that small businesses often suffer shortages of both long term and operating capital. He detects a pattern among such firms where there are heavy negative cash flows during the start up period. The inadequate level of working capital to support sales during the formative period means that the business is 'overtrading'. The result is that many concerns do not survive those first few years of inadequate cash flow. While such an analysis may be accurate in relating small business liquidity problems to a fluctuating and largely exogeneously determined sales rate, one must wonder if internal policies could be designed to attenuate the effects of these fluctuations. Such a proposition has rarely been tested although it is the major objective of the present study.

Why does the small firm find it so difficult to manage cash flow? DeThomas (1982) points out that the relations which link working capital, funds flow and cash requirements are dynamically complex and relatively difficult to understand. The subtleties of funds flow are not easily understood by applying mechanistic formulae. Thus, he argues that such simple notions as funds flow being equal to cash flow plus depreciation are inappropriate in many instances since they assume too many other things to be equal. Typical funds flow equations imply constant inventory levels. This is only likely to be the case where operations themselves are stable over time. If this is not the case, it is important to analyze alternative means of liquidity adjustment such as changing receivables or inventory levels. DeThomas stresses the implications of the sort of instability which he feels characterizes small businesses.

for FFO (funds flow from operations) to be a good measure of the liquidity generated by operations, credit sales must be collected at approximately the same rate as expenditures made for the cost of operations. This will be the case as long as the firm's volume of operations remain relatively stable. Where the firm is subject to sharp seasonal or cyclical influences or is experiencing rapid growth, there will be a significant lag between the liquidity actually experienced from operations and that reflected in the calculations.

DeThomas, 1982, p. 41.

In summary, the available evidence suggests a link between high failure rates and inadequate financial control. It also points out that an inadequate appreciation of the dynamics of cash flow management is central to the problem. A modelling framework is needed which can deal with the issues of dynamics and interactions. This suggests that SD is the best available tool.

MODEL DESCRIPTION

A model was constructed to simulate the experiences of a case study business in managing current assets and liabilities. The firm in question is in retail merchandising and is subject to considerable sales seasonality. The focus of the study was not on changing the sales pattern but rather on understanding the relationship between sales and changes in the various working capital accounts - levels such as inventory, receivables, payables and cash. This model owes a debt to Lyneis (1973, 1980) who first used SD to study problems of working capital management.

The current research examines the effects of seasonality on the firm's liquidity, cash flow and financial ratios. Using SD enables us to comprehend operating cycle dynamics which were identified as being important for small business survival. The first stage in improving financial planning involves developing and understanding of the causes of the dynamic behavior which is observed. From this one can progress to the testing of alternative policies which might enable the firm to respond better to environmental turbulence. The influence diagram is shown below.

Figure 1: Summary Influence Diagram

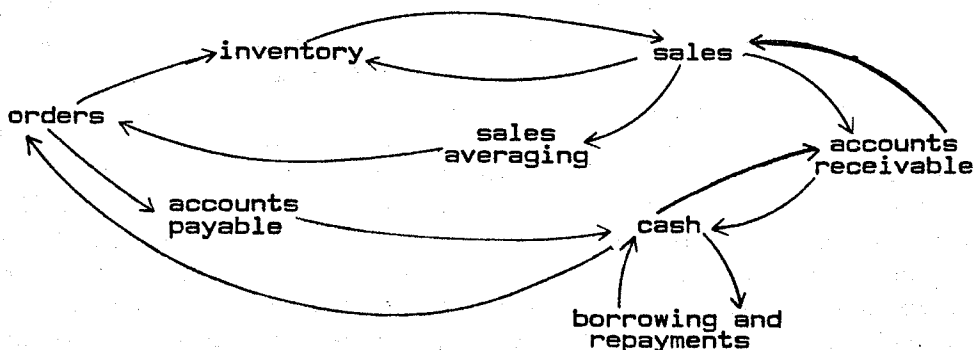


Figure 1 summarises many of the relationships which the literature review identified as being vital for small business survival. Sales are made from current inventory but without adequate levels of merchandise sales will be lost. Merchandise orders are based on the historical pattern of observed sales as well as current inventory levels. After a delay the merchandise arrives in inventory. Ordering from suppliers means incurring accounts payable which require cash outflows at a later time. Cash is generated either from cash sales or from the collection of receivables accumulated from prior sales. The business also has available a line of credit to enable it to survive periods of negative cash flow. Without adequate cash, the firm will be forced to cut back merchandise orders and restrict the credit it offers to customers. These will then have an adverse impact on future sales and cash flows.

RESULTS

This section presents the findings observed in various model runs. The results reported here are confined to observing the behavior patterns of the various financial variables during the base mode. These cast an extremely interesting perspective on the financial problems faced by small businesses. A second group of experiments involved an evaluation of alternative control policies. It sought to improve the firm's liquidity position through the operating cycle. Due to space limitations, these are not presented here; a separate paper is forthcoming.

The literature review pointed out that a number of small business writers were aware of the complexities of funds flow dynamics. The studies reported were, however typical of this genre in basing their analysis on experience, intuition and isolated, fragmented illustrations. SD enables a more complete analysis of the interrelations involved. The model's base mode behavior makes the dynamics much more transparent than they could be from an intuitive analysis.

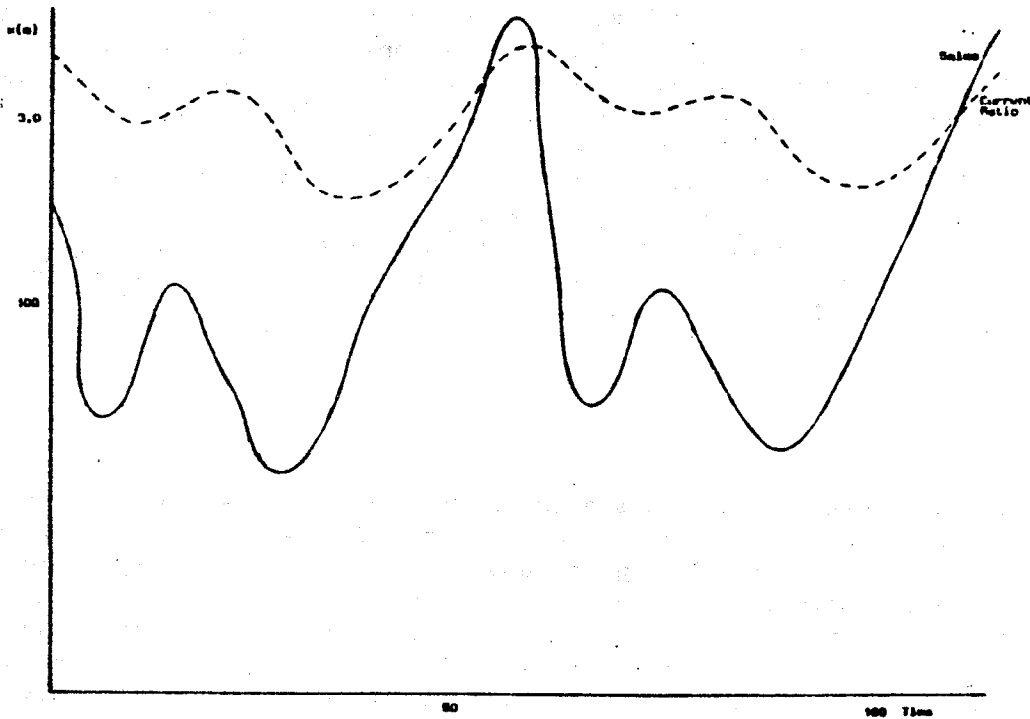
#1: The Dynamic Behavior of Working Capital

These involved studying the base mode in order to understand the behavior of the working capital accounts; cash, receivables, inventory, payables and short term debt. The current ratio which is often used as a summative measure of liquidity was also observed. While the current ratio is often thought of as a static bench mark against which a given firm's financial position can be compared, its behaviour is subject to many dynamic forces as shown below.

Figure 2 shows the time paths for sales and the current ratio and shows how the firms overall liquidity varies over the year. Both exhibit two peaks during the year associated with the seasonal sales pattern. The current ratio follows the sales rate after a lag. The maximum points for the current ratio are just after merchandise inventory has been paid for - which will be just prior to sale given the magnitudes of the delays involved. At that time, the numerator of the ratio is at its greatest but the denominator is relatively low.

The diagram also shows that current ratio fluctuations are much more attenuated than those of the sales rate. This is because the level variables in the ratio (cash, receivables, inventory and payables) will tend to smooth out some of the effect of sales fluctuations. The sales rate, by contrast, is

Figure 2: Sales and the Current Ratio

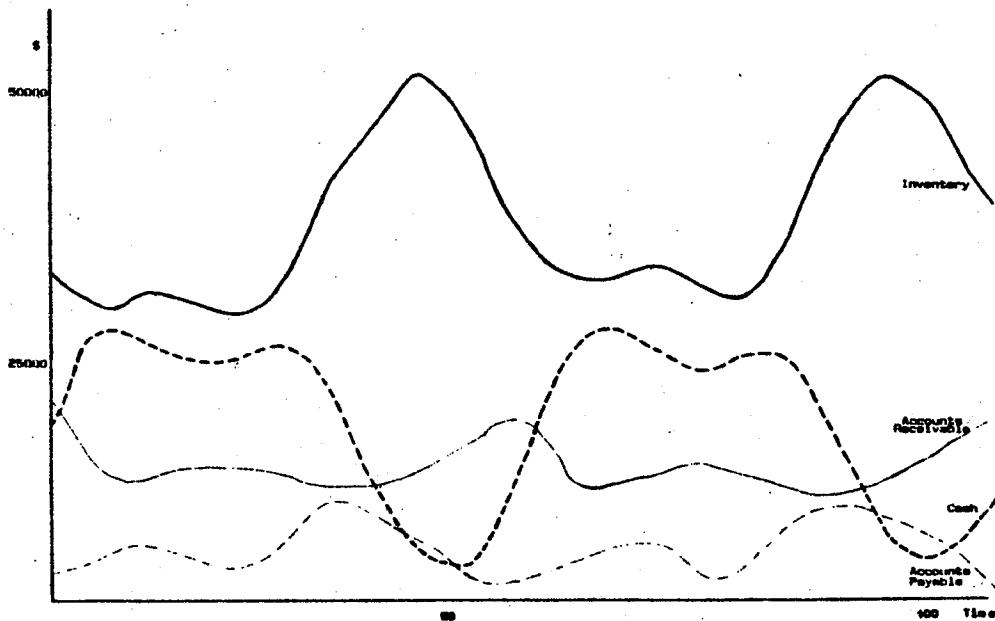


independent of previous system accumulations and is thus able to fluctuate more freely. In essence the current ratio is a smoothed version of the sales rate. The effect of the accumulations on dynamic behavior, in turn, causes the current ratio to lag the sales rate. The interrelations between the two variables are of such complexity that it is difficult to imagine that an intuitive analysis could develop a simple heuristic to explain behavior. As Figure 3 shows however, a decomposition of the elements in the current ratio provides a much clearer picture of the forces at work.

Figure 3 illustrates the fluctuations of the various current asset and liability accounts. The complexity of interaction among the working capital variables is clearly shown. Inspection of Figure 3 reveals that inventory and payables follow roughly similar patterns as merchandise is purchased in advance of sales. The turning point for payables is ahead of inventory because the average payment period (delay) for payables is only three weeks whereas inventories are held much longer. Thus payables are paid off before merchandise is sold. This also explains the fact that cash fluctuates in an almost opposite pattern to inventories. Rising inventories (caused by merchandise orders) cause falling cash after three weeks as merchandise is paid for. Later falling inventories are the product of increases in sales which generate some cash immediately and some after a period. This process is reinforced by the behavior of accounts receivable which peak ahead of cash since receivables are accumulated at the time of sale and are collected after a delay (the average collection period).

Thus, a SD analysis of the operating cycle views the observed patterns of dynamic behavior as being caused by the interaction of a number of current asset

Figure 3: Current Account Variables



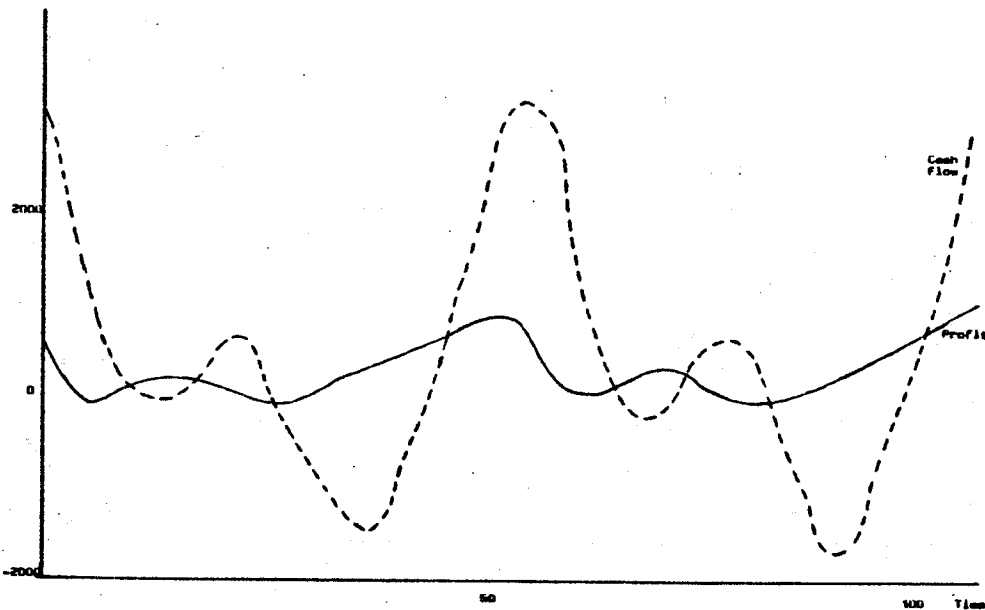
and liability accounts which are levels possessing differing delay constants. One could generalize further to argue that the amplitude and phasing demonstrated in Figure 3 can be explained with reference to the magnitude and nature of the delays (holding periods) for receivables, payables and inventory. Because the average payment period is less than the inventory holding period, payables fluctuations will lead and will be of greater amplitude than inventory fluctuations. Similarly, merchandise orders turn cash into inventory but sales turn inventory into cash. Since orders must precede sales, the dynamic relation between cash and inventory can be expected to be an opposite one with inventory fluctuations preceding those of cash. There is also a delay between increases in accounts receivable and corresponding cash increases depending on the receivables collection delay. This factor is partially obscured in the model by the manner in which the cash and credit mix in sales varies during the year.

The chief point to be stressed is the power of SD to provide an understanding of processes which might otherwise seem hopelessly confusing. An approach which explains the manner in which time phasing and delay constants affect operating cycle variables has the promise of increasing understanding of the dynamic processes involved. These insights provide the basis for a generic model of operating cycle behavior based on SD principles.

#2: Profits and Cash Flow

Many analysts have stressed that profits and cash flow do not go hand in hand, at least in the short run. This can be seen from the base mode behaviour shown in Figure 4. Profits are relatively stable throughout the year but cash flows fluctuate dramatically. The periodicity of the variables also differs.

Figure 4: Profits and Cash Flow



While profits appear to be steadily improving from $t=25$ thru' $t=50$, cash flow first worsens and then improves rapidly after $t=35$. Thus any business which assumed profitability to be an acceptable surrogate for cash flow would be most unwise. It can also be seen that profits only fall below zero for a brief period during the year (when sales are so low that they are unable to cover fixed operating expenses). By contrast, cash flow is negative for almost as much of the time as it is positive.

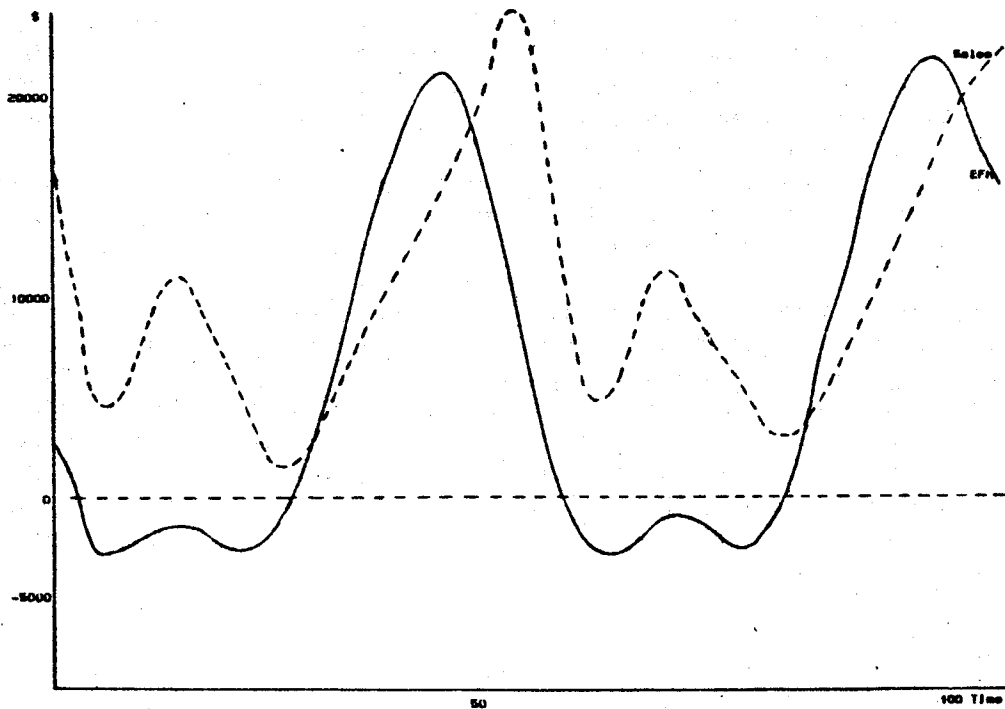
The cause of the differing behaviour of profits and cash flow involves the smoothing effect of generally accepted accounting principles (GAAP). Equations for cash flow are sensitive to fluctuations in inventories, payables, receivables and cash. The matching convention of GAAP however, excludes these elements by calculating the cost of inventory sold and subtracting it from revenues at time of sale. This latter process will produce a much smoother output since it excludes from consideration most of the factors which cause fluctuations in current assets and liabilities. Although the effect of the matching principle in smoothing income and expenses has long been recognized (see, for example, Hendrikson [1970]), an analysis of the dynamics involved has rarely been made explicit. In the context of a small business, such processes are extremely important for the interpreter of accounting data.

The results also illustrate DeThomas's caution about the misleading nature of 'short cut' measures of cash flow. Net cash flow is often approximated as 'net profits after tax plus depreciation and amortization'. An examination of Figure 4 suggests that adding a constant amount for these noncash charges to cash flow could not possibly cause the net profits function to behave in the same manner as cash flow. They exhibit widely different behavior patterns.

Figure 5 explores another aspect of cash flow dynamics by illustrating the manner in which the firm's need for financing varies during the operating cycle. The model defines working capital needed to finance operations as outstanding payables and bank borrowing less cash. Since bank loans for this business are constant because short term credit has been continuously 'rolled over', it is fluctuations in cash and payables which determine financing needs. Notice that EFN is negative for over 20 weeks during the year. This implies that the cash balance exceeds current borrowing so that the firm could on balance, become a net lender of funds. A temptation may exist for the owner to use this surplus cash for other purposes. This would be foolish however since it is needed to finance inventory in anticipation of sales and the firm is soon back again to depending on outside funds.

The dynamic pattern of funds needs depends on sales rate fluctuations and the businesses' working capital policies. The time path for EFN shown in Figure 5 is interesting in highlighting the risks of insolvency for the small firm. Without financing, the company will be unable to carry inadequate inventory levels and will lose sales. The ability to borrow is, however, subject to the discretion of suppliers and bankers. This leaves the business in a state of uncertainty about the availability and cost of financing. Policies which shift cash flow dynamics so as to make the firm more self-reliant might be considered advantageous, even if they involved some loss of profits.

Figure 5: Sales and External Financial Needs



DISCUSSION OF RESULTS

The model identified behavior patterns for the financial variables and ratios and explained their behavior in terms of system structure. An understanding of the delays involved in receivables, inventory and payables provide the key to understanding working capital fluctuations. As with any SD study, fluctuations are explained by the dynamic interrelation between the elements.

The model also highlighted the considerable differences between cash flow and accounting income. It was shown that GAAP apply a sort of smoothing to the data to filter out the effects of changes in the working capital accounts. Cash flow will therefore fluctuate much more than accounting income. The users of financial information must consider which perspective is most useful. Welsh and White (1981a, 1981b) stress that it is the ability of the firm to finance fluctuating levels of working capital that is the key to small business survival. Indeed, for many purposes, cash flow is much more significant (and dynamically interesting) than accounting income. The business needs to understand its behavior rather than use inadequate approximations such as cash flow being equal to net profits plus depreciation. Managing cash flow requires an appreciation of the relation between system delays and cash flow variations such as a SD analysis makes possible.

The model also stresses the ever changing levels of external financing which are needed to sustain the small firm through the seasons. Cash budgeting techniques are widely used in practice to forecast borrowing requirements. The model shown here is different in that it seeks to explain the behavior patterns involved in terms of recurring interrelationships rather than predict their magnitude on a short term basis. In effect, one is making cash flow more endogeneous by considering the whole system rather than the individual elements in isolation. Focussing on the qualitative nature of cash flow's dynamic behavior rather than its expected level enables a more complete understanding of the operating cycle and policies which can be used to affect it. Simulation is widely used for cash forecasting (Lerner [1968]). The use of SD provides a more flexible framework for simultaneously planning funds requirements and understanding the underlying system dynamics.

There is a common theme to the results which have been presented here. It is that an improved understanding of working capital fluctuations is made possible by analyzing the dynamic processes involved. Factors which would be considered as separate and exogenously determined are fused together through SD principles into a comprehensive framework. One is treating working capital management as an inherently more dynamic and interrelated process than other modelling frameworks are capable of doing. Such an approach may therefore bring the sort of breakthrough which is needed if we are to help the small business increase its chances of survival.

CONCLUSION

In conclusion, it is necessary to stress the limited extent of the results so far reported... They were based on the experiences of one case study firm and other sorts of firms would show quite different behaviour patterns. At the present moment the research is being extended to a broader sample of firms and

from these models the commonalities involved in managing working capital in the small business should emerge. From these may emerge a generic model of the issues involved. Most of the elements involved here (in particular the view of working capital accounts as interrelated delays) are already clear.

Due to space limitations, the present paper has also been unable to discuss the policy experiments which were also conducted using the model. Clearly, the ultimate purpose of understanding the relation between dynamic system structure is to search for those elements which could be redesigned to provide an improved response. Tests on the model suggested that there are complex trade-offs to be considered between liquidity, risk, reliance on outside financing and the ability of the business to respond to sales fluctuations. There is considerable scope for future research here.

This paper has, however drawn attention to the manner in which System Dynamics is an ideal tool for providing an explanation of the causes of financial instability in the small firm. This is an issue of much practical importance and one in which other approaches (whether more or less 'academic') do not appear to have had much impact on everyday practice. The authors are therefore optimistic that further efforts in this direction could yield significant progress and could bring about a wider dissemination of the System Dynamics method.

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