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Small business modeling within the financial accounting conceptual framework

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Abstract

The accounting conceptual framework, outlined in the CICA (Canadian Institute of Chartered Accountants) Handbook, is used to create a continuous feedback financial model to study the behavioral aspects of the small business environment. With this framework, parameters of importance can be bound together through established *pre-defined* relationships. Based on a control model, various parameters were altered to simulate various business events. The information gathered seems to reflect behavioral patterns seen as a result of such business events.

1 Introduction

With the arrival of the new millennium, record numbers of entrepreneurs are starting and operating their own independent businesses. (Office of Advocacy [1]) In the face of great market uncertainty and few resources, more than half will face financial distress and failure within five years of commencing operations. (Office of Advocacy [2]) In theory and practise, there are a number of methods used for monitoring and reporting on business operations and the likelihood of financial distress. (Hyden [3])

The most commonly used methods are prediction models, particularly those involving success and bankruptcy/failure models. Over the years, different model versions have been developed to try to distinguish failing from surviving businesses. The earliest and most commonly used model is "univariate" but in the last few decades, the focus has changed to "multivariate" prediction models, which allow for simultaneous interaction between variables. In turn, this has lead to "artificial intelligence" or alternately called "neural network" models that are able to simulate thought processes and identify behavior patterns.

(Morris [4]) However, tests on these prediction models have shown that none is entirely satisfactory at differentiating between bankrupt and non-bankrupt firms. (Morris [4], Mossman [5])

Research of business financial planning models that provide comprehensive analysis has been mostly restricted to general discussions on possibilities of a computer-based model (Hyden [3], Chapman [6]), private practise (Chapman [6] Beasley [7]) and industry developed Decision Support System (DSS) software. (Sterling [8], Beasley [7])

This study proposes to introduce the idea of creating a financial planning model that incorporates the accounting conceptual framework used in practise by all businesses, for the future empirical analysis of the small business environment.

The next section briefly describes the methodology used to develop the simulation model and how certain parameters were selected to be representative of a small business. Data and analysis are described in the third section. The fourth section presents the conclusions and implications regarding the viability of this method of modeling.

2 Methodology

2.1 The Conceptual Framework and the Model

In practise, all Canadian businesses must report their economic activity using the financial accounting conceptual framework as set out in the CICA (Canadian Institute of Chartered Accountants) Handbook so as to eliminate potential dangers of bias, misinterpretations, inaccuracy and ambiguity. The framework sets forth general *pre-defined* guidelines in determining procedures, practices and rules that are stipulated by a standards setting board. (Kieso [9]) Using this framework investors, creditors, and managers classify transactions that characterize economic activity and provide accurate information in the form of various financial statements. The Small Business Model proposes to use the same framework in the construction of a financial planning model.

2.2 Quantification of the Small Business Model

While business can vary in type, method of operation and maintenance, the method of reporting financial activity is the one constant. All business can be broken down into sectors of financial activity (accounts) fed by a variety of sources. At any given moment, these accounts have a discrete value, but change over time with each transaction representing the flow of funds. These sectors of activity may represent departments or areas of a business for the purposes of simulation.

The CICA Handbook clearly states how funds flow from sector to sector through *pre-defined* relationships and structure. As a result, there is no ambiguity or assumption required regarding how these accounts relate to one another, or assumptions about the sectors influencing each other. Figure 1 is a generic influence diagram used for business simulation. Using the financial

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accounting rules the influence coefficients between sectors will be determined by the financial relationship between the sectors and need not be assumed.

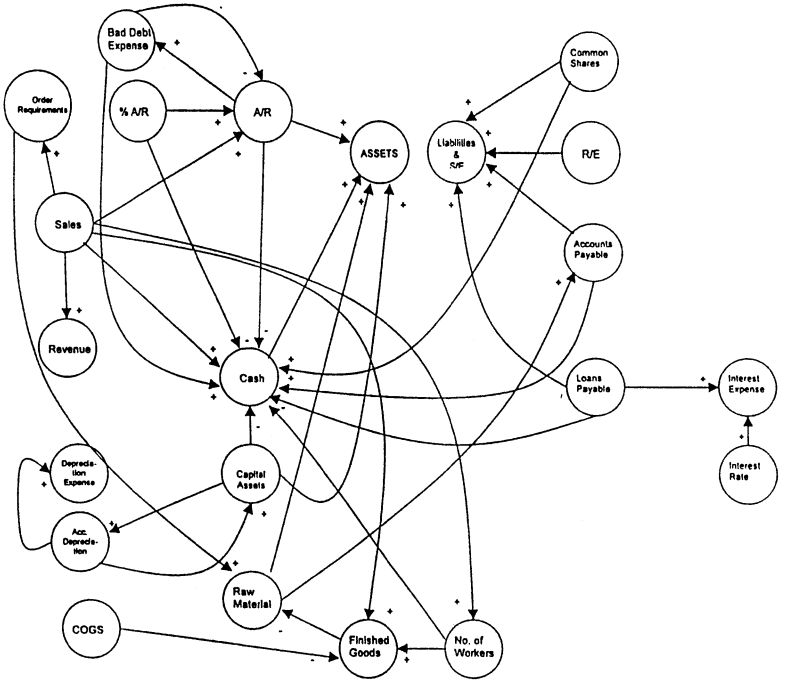

Figure 1:Generic influence diagram: Balance Sheet

2.3 Parameters

While large and small businesses often share similar economic activity parameters which are represented by accounts, the number of accounts associated with smaller businesses is greatly reduced. Hence, the Small Business Simulation Model is based on a generic small business with accounts resulting from specific economic activities, as identified in Table 1. However, the Model is flexible and more accounts resulting from additional economic activity can be added, deleted, modified or extended.

Table 1. Types of small business economic activities.

Accounts Receivable	Accounts Payable
Bank Loans	Common Share
Raw Material Purchase	Sales & Revenue
Insurance Purchase	Capital Assets
Patent Expenses	Wages
Warranty Expenses	Sales Taxes

In practise, the flow of funds during economic activity is identified by a series of events that are known as *journal transactions or entries.* Each transaction involves the exchange of funds between two or more accounts. The form in which the financial activity is recorded is generally known as "double entry bookkeeping".

2.4 Powersim V1.1

This computer-based model could have been created using a variety of different applications or building languages such as: spreadsheets, simulators or simulation software packages, simulation languages or general purpose languages. Out of the four possibilities, simulators or simulation software packages were the most suitable. Spreadsheets can only be used in limited static or stochastic simulations, and simulation and general purpose languages are often too difficult for non-programmers to understand.

Simulators or simulation software packages allow the construction of a system with little to no programming experience. Available software includes Arena, ProModel, SimEngine, Powersim and Stella. Powersim V1.1 was chosen because of its availability and ease of use. It is a dynamic modeling simulator that is designed to support a wide variety of quantitative and experimental approaches to management issues. (Model Data [10]) Powersim V1.1 facilitates the study of dynamic systems using various graphical notations. Tools from menus and toolbars can be used to create large complex multiple feedback systems. An example of the simulation symbols used for flow diagrams is shown in Figure 2.

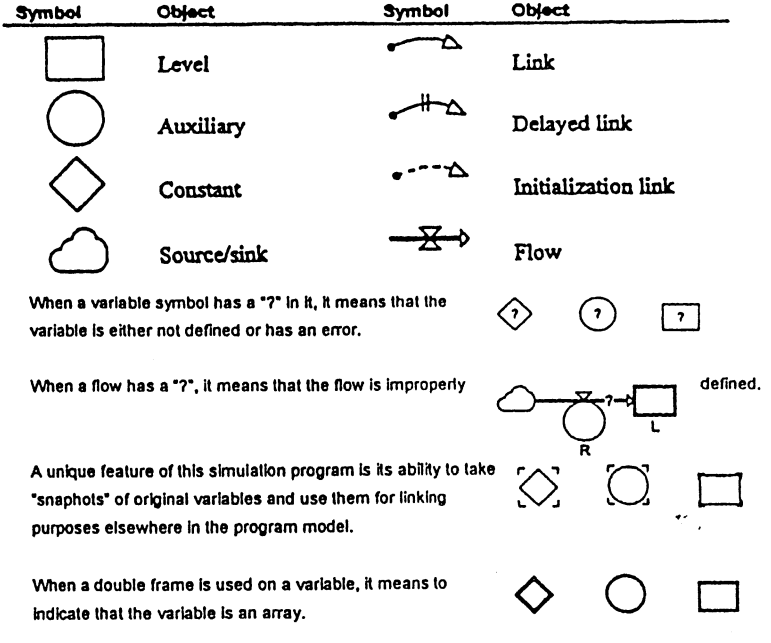

Figure 2: Simulation symbols used in flow diagrams.

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Figure 3 shows the use of the simulation symbols in the graphical modeling of a small sector of a business.

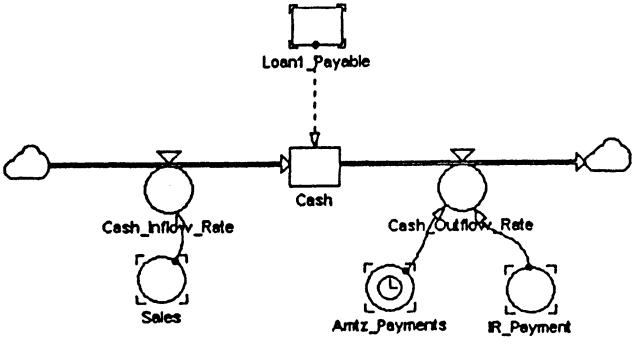

Figure 3: Graphic model of a business transaction; repayment of loan & interest

2.5 Coding

The Small Business Simulation Model attempts to simulate the previously selected economic activities for a generic small business by mimicking its related transactions in Powersim V1.1. By linking all the transactions, funds are transferred into their proper accounts. Some non-financial parameters were also incorporated to assist in the initialization of certain transactions.

What resulted was a set of accounts yielding different valuations. However, these accounts have little meaning individually. Therefore, additional code was produced to group certain accounts together to generate financial statements such as Balance Sheets and Income Statements. Currently, both the Statement of Retained Earnings and Statement of Changes in Cash Flow Position have not been generated.

Since Balance Sheets are required to be "balanced", verification of the model is instantaneous and continuous.

3 Data and Analysis

By coding the series of events, a control reference model (main.sim) was generated. This model runs over a 15 year period with the assumed 260 working days in a year and is capable of generating the previously stated financial statements that report on current business conditions.

A number of other assumptions were made regarding the model:

1. Both interest and income tax were expensed in the appropriate years.
2. Retained earnings were equal to Net Income as no dividends were issued.
3. All profits were assumed to be reinvested.

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Using the control reference model, two particular situations were tested:

1. Bank Loans
2. Cyclical Sales

Three separate trials with differing conditions for each situation were run. These trials were meant to show the potential of the concept, not specifics.

The original control model included a bank loan. Trial 1 eliminated the bank loan and instead chose to assume that the needed capital was raised through the issuance of common shares. All other parameters remained fixed in a steady state. The business performance is shown in Figure 4.

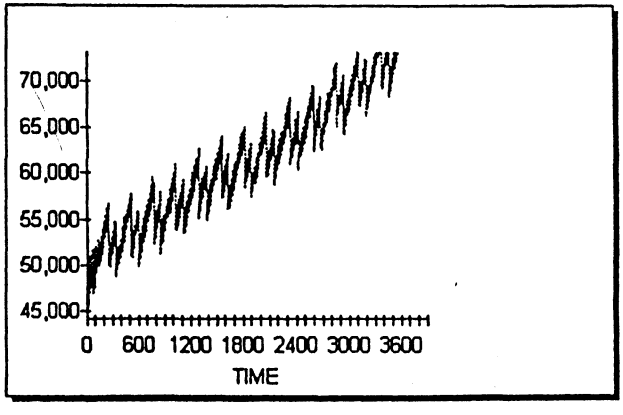

Figure 4: Balance Sheet without bank loan.

With no loans outstanding, steady state of sales and reinvested earnings, it appears that there were no problems in its slow but steady growth from year to year. However, this is not normally the situation. Most business startups lack the necessary capital to begin operations and must seek loans or other investors to compensate. The following two trials would examine the usual situation.

Trial 2 assumed that the business was issued a bank loan for $20,000 with a 5-year amortization plan at 10% interest. The loan was employed instead of issuing more shares to assist financing the startup of the business.

As a result, over the first five years, the net worth of the business suffered a dramatic reduction in net worth. Fortunately, enough revenue was generated to continue operations but it left the business "struggling". This is evident in Figure 5.

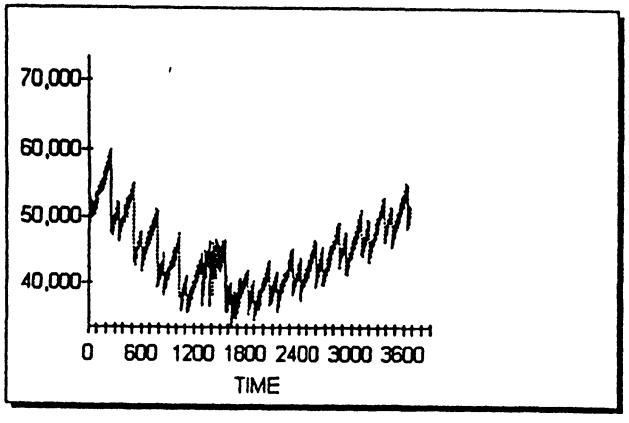

Figure 5: Balance Sheet with bank loan.

Trial 3 replicates Trial 2, except the number of amortization years for repayment is shortened to 2 years. When the number of years to repay the loan were reduced, the effect was dramatic. Net worth dropped radically and unless other sources of capital were located, or sales rose, the business collapsed from a lack of operating funds. This situation is not unusual since bankruptcy in the first five years is the most common reason for business closure. (Dun & Bradstreet [10])

The reference control model assumed a steady state of sales. Trial 4 assumed a cyclical sales pattern. Sales were modified to produce a sinwave over the year while holding all other parameters constant. The effect of cyclical sales on assets is shown in Figure 6.

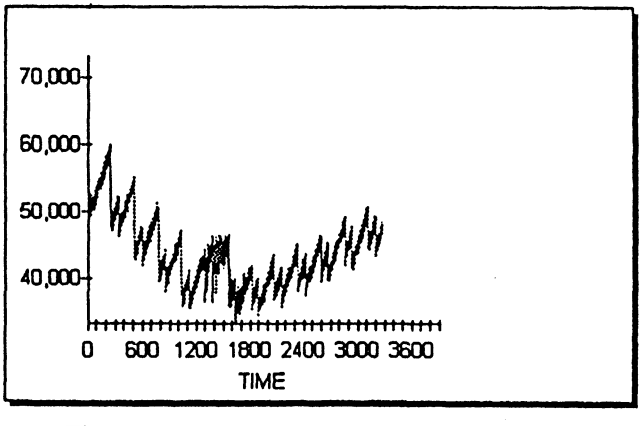

Figure 6: Balance sheet trend for cyclical sales.

The effect was similar to the results that were generated by the control model since the production staff was held constant. The backlog of work that resulted was slowly worked off during the slow season of the cyclical sales. However, it

is doubtful that most customers would wait a half-year for delivery of their orders. The following two trials examine the possible methods for handling cyclical sales.

Trial 5 replicated Trial 4 but also varied production staff to compensate for the varying workloads.

Code was created to add or reduce staff where necessary to handle the variation in order volume. While backlogs still occurred, the ability to vary production staff quickly dissipated them, and allowed revenue to be generated in the appropriate periods with quick order turnaround. The effect of staff change on the corporate balance sheet is seen in Figure 7.

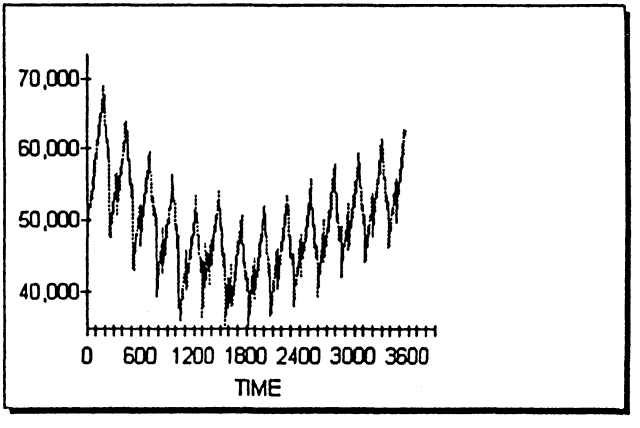

Figure 7: Balance sheet trend with additional staff.

Trial 6 also replicated Trial 4 but allowed for customer cancellation of orders when production was backlogged. It is not unusual for customers to cancel orders when a long wait is involved.

Code was created to terminate sales orders should the backlog rise beyond a certain point. When production staff was held constant, the business collapsed. When cancellations occurred, workers were often left without work, and not enough revenue was generated to sustain the business.

4 Conclusions

1. All trial results would seem to indicate that there is some potential for using the financial accounting framework as a structure for small business financial planning models. Behaviors exhibited in the trials seemed to correspond with those observed in practise.
2. An advantage of the use of the Small Business Simulation Model based on accounting rules is that the validity of a model is immediately confirmed by the balance of the transactions.
3. The model based on accounting principles allows management to monitor a functioning business and very quickly determines inefficient sectors of the operation.

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4. By comparing cash flow behavior between sectors of a business, updated influence coefficients for simulation are continuously available. Influence coefficients no longer need be assumed.

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