Managing Credit Collateral
Collateral is a Resource That Needs to be Managed

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ABSTRACT

The Theory of Constraints (TOC) has recently gained much success in its application to industrial and service organizations, mostly on the shop floor. This paper applies the TOC principles to the management of financial decision making, and shows that the philosophy can be of much use in this area. A case study of managing credit collateral is presented and solved using the TOC methodology, while collateral is treated as a resource that has to be managed.

INTRODUCTION

The Theory of Constraints (TOC) is a management philosophy and a set of techniques that enable the manager to focus on a small number of constraints, those factors that impede organizational performance. Better exploitation of the constraints (the internal bottlenecks, for example) will substantially improve organizational performance. Proper management of the system's bottlenecks will ensure maximum throughput of the existing system and a shortening of response time. These are the factors that affect profitability and customer satisfaction.

TOC was developed in continuation of the OPT theory (Ronen and Starr, 1990) and is widely used in production and manufacturing.

This paper exemplifies the use of TOC in the financial decision making process, and shows the high potential of this managerial approach in area that is not connected with production or manufacturing.

In economies such as Israel and certain European countries, where the capital market is not fully perfect, many firms are in the position of not being able to exploit available credit facilities for lack of adequate collateral. From the point of view of the firm, the ability to provide collateral is in fact a necessary condition for receiving credit from the banking system.

The demand for collateral as a condition for receiving bank credit is virtually neither recognized nor explained in the finance literature (for the traditional approach, see for example Modigliani and Miller, 1958, 1963, or Smith and Warner, 1979). In Western capital markets, and especially in the United States, the degree to which the banking system is based upon external collateral is much lower than in Israel and certain European countries, where in many cases the collateral is the system's constraint.

Proper management of the granting of credit collateral is essential mainly for small firms that cannot in fact raise capital directly on the stock exchange by public offerings. The dependence of these firms upon their ability to obtain bank credit is critical.

THE ABILITY TO PROVIDE COLLATERAL IS AN EFFECTIVE CONSTRAINT OF THE FIRM

It should be noted that subordinating credit allotment considerations in the banking system to the quality of the client's collateral has substantial macro-economic ramifications. In our opinion, there has been a degeneration in

the credit allotment system that is likely to lead to a loss of efficiency in the allocation of resources in the economy and to a significant increase in bankruptcy costs as happened in the US prior to current emphasis on cash flow considerations.

The ability to provide collateral constitutes an effective economic constraint that the firm, especially small ones, must take into account in its financing and investment decisions. Managers must recognize the fact that as far as bank collateral is concerned different assets have different relative values. The ability to provide collateral is a limited resource, sometimes the system's constraint, that must be managed in order to derive maximum profits through credit at minimum expenses. We will show that global considerations and global view will derive different decisions than those derived by using the cost of capital as the local decision variable. We shall propose the Theory of Constraints (TOC) methodology, proven by the Linear Programming approach (Goldratt, 1991; Ronen and Starr, 1990), for better decision making regarding collateral-consuming activities, such as providing bank guarantees to a third party, and calculating the premium that it is worth paying for activities that "create" collateral, such as obtaining owner guarantees or nonsecured credit.

APPLYING TOC TO COLLATERAL MANAGEMENT: A Real life Example

Figure 1 gives a schematic presentation of the TOC approach.

Figure 1:
SCHEMATIC PRESENTATION OF MANAGEMENT BY CONSTRAINTS

Identify the system's constraint(s).

Decide how to exploit the system's constraint(s).

Subordinate everything else to the above decision.

Elevate the system's constraint(s).

If, in the previous steps, a constraint has been broken,go back to step one,but do not allow inertia to cause a system's constraint.

The subject of the example is a transport company which provides services to institutional clients. To fulfill its obligations to its clients the company must operate a fleet of 20 trucks and maintain four offices located throughout the country.

The company's first problem is to decide whether to purchase or lease its assets. The relevant data are as follows see Figure 2):

Figure 2:
A REAL LIFE EXAMPLE

Trucks	
Number Required	20
Purchase Cost of a Truck	200,000
Annual Rent of a Truck	23,000
Yield of Lease	11.5%
Income per Truck	18,000
Collateral Rate	25%
Offices	
Number Required	4
Purchase Cost of an Office	300,000
Annual Rent of an Office	30,000
Yield of Lease	10%
Collateral Rate	40%

—The purchase cost of each office is 300,000. Each office may be leased at an annual rent of 30,000.

—The cost of each truck is 200,000. A truck may be leased at an annual rent of 23,000.

—Agreements may be reached with "partners" on ownership of a truck that will enable purchase of "part of a truck".

—The income from operating a truck (before paying rental charges) is 18,000 per year. Operating a rented truck thus gives a negative throughput 5,000 (18,000-23,000).

The company must operate 20 trucks to meet its obligations to its clients, and will therefore be obliged to lease trucks despite the negative throughput (contribution) of so doing.

—The company has own financial resources for investing in operational assets in the amount of 1,500,000.

—Credit may be obtained for financing the investment in operational assets. The credit is available at zero real interest rate, against collateral. For collateral purposes the offices are valued at 40% of their cost, and the trucks at only 25% of their cost.

At first glance, it would seem that investing in trucks would contribute more to profitability of the company than investing in offices. Purchasing each truck (as opposed to the alternative of leasing) contributes a throughput of 23,000. The investment input is 11.5% (23,000/200,000). Purchasing an office yields a throughput of 10% only (30,000/300,000).

It would thus seem reasonable for the company to lease the four offices that it requires, to purchase ten trucks and to lease the remaining ten. The ten trucks would be purchased with the existing resources of 1,500,000 and a loan of 500,000 (against a collateral of ten trucks), at a total cost

of 2,000,000. (For purposes of collateral, the trucks are valued at a quarter of their cost.)

Implementing this decision will lead to a throughput of 10,000 only. Operating ten owned trucks will yield a throughput of 180,000, operating ten leased trucks will lead to a negative throughput of 50,000 and the company will be obliged to pay 120,000 rental charges for the offices. The total throughput is thus 180,000-(50,000+120,000) = 10,000.

This mix of assets is of course not the optimal one. Following the TOC focusing steps, we shall first identify the system's constraint. The constraint facing the company and preventing it from realizing the 360,000 that can ostensibly be made from operating a fleet of 20 trucks is the lack of resources for purchasing assets, i.e., the lack of collateral. As already noted, the company has own available resources of only 1,500,000.

Then, the company has to exploit the system's constraint. The company must examine the effect of each decision that it makes on the utilization of this constraint. Purchase of a truck "consumes" 200,000 of the constraint and "creates" 50,000 of collateral for credit. Purchasing an office consumes 300,000 and creates collateral of 120,000.

If we examine the contribution to a unit of constraint we shall see that the contribution of investing in an office is 30,000/180,000 = 16.67%, whereas the contribution to a unit of constraint of investing in a truck is only 23,000/150,000 = 15.33%.

Thus the optimal decision will be to purchase all four offices (at a cost of 1,200,000). This investment will consume 720,000 of the limited resource. With the remaining resources it will be possible to purchase 5.2 trucks [(1,500,000-720,000)/150,000] at a cost of 1,040,000. It will then be necessary to lease the additional 14.8 trucks. The investment will be financed by the own resources of 1,500,000 and a loan of 740,000. The four offices will contribute 480,000 in collateral and the 5.2 trucks will contribute 260,000. The profit will be 19,600 (18,000x5.2-5,000x14.8 = 19,600). The local decision versus the global one are shown in Figure 3.

Figure 3:
COMPARISON BETWEEN THE LOCAL AND THE GLOBAL DECISIONS

	Local	Global
Owned Trucks	10	5.2
Throughput	180,000	93,600
Leased Trucks	10	14.8
Throughput	(50,000)	(74,000)
Owned Offices	0	4
Throughput	0	0
Rented Offices	4	0
Throughput	(120,000)	0
Total Throughput	10,000	19,600

The problem may be formulated and solved by means of linear programming (see Appendix 1).

Even if we assume the existence of a positive real interest rate, the optimal asset will not change as long as the real interest rate is less than 4%.

We shall make use of this basic example to illustrate how better decisions can be derived.

Giving a guarantee to a third party

Let us now assume that there is another institutional client interested in the transport services of the 20 trucks and prepared to pay higher trucking fees. If the company enters into a transaction with this customer its profits from operating each truck will increase from 18,000 to 19,500. This client, too, insists that the company maintains four offices, and, as a condition for entering into the transaction, demands a banker's guarantee of performance in the amount of 500,000. The client is prepared to compensate the company for the bank's commission in the matter of the guarantee (about 4% per year). The bank is prepared to provide the guarantee only against collateral and includes the amount of the guarantee in the credit framework approved to the company. This means that collateral is attached to securing the guarantee and the collateral available for securing the loan is reduced. Is it worth the company's while to accept the offer? At first glance, it would seem that the operating profit of the company will increase by 30,000 (1,500 x 20). However, we must examine the effect of the transaction on the resources for investment constraint. Accepting the offer will lead to a decrease of the resources by 500,000. As the return to a unit of the constraint (the shadow price) is 15.33%, this means a loss of income in the amount of 76,667 (0.15333 x 500,000). Thus, accepting the offer will lead to a decrease in the company's profit and decrease the capability of the company to obtain additional credit.

Shareholders' Adequate Compensation

Another Problem is that some of the shareholders are unable (or unwilling) to provide their relative share of personal collateral.It is proposed therefore that those shareholders who are willing and able provide collateral that will enable the company to borrow an additional 500,000 at a premium of 6% per year. It is worth the company's while to agree to this proposal? It is clear that as the shadow price of the constraint is 15.33%, it is worthwhile to pay a premium of 6% and to incliateral and thereby increase the capability of the company to obtain additional credit. The result of this course of action will be an addition to the annual profit of 46,667! (500,000 x 9.33%).

Solving the problem with TOC state of mind results in

the optimal solution of x1 = 8.53; x2 = 11.47; y1 = 4; y2 = 0, and the profit will be 66,267.

The effective cost of different loans

Let us assume that another bank offers the company credit at a real interest rate of 1.5% per year and is, for collateral purposes, is prepared to value the offices at 50% of their cost and the trucks at 25%. At first glance, it seems that this offer should be rejected outright, as the company at present enjoys credit at a real interest rate of zero. However, if we examine the effect of the offer on the effective constraint we see that it leads to the creation of additional credit resources in the amount of 120,000 (10% x 1,200,000). The company can do use this because 14.8 trucks are rented. These additional resources will result in a contribution (before interest) of 18,400. The total credit of the company will be 860,000 and the financing costs will be 12,900 (860,000 x 1.5%). Thus, accepting the offer will result in an increase in profit of 5,500 (18,400-12,900). The same solution can be easily achieved also by means of Linear Programming.

Appendix 1:
A LINEAR PROGRAMMING APPROACH

Let
x1 - an owned truck
x2 - a rented truck
y1 - an owned office
y2 - a rented office

The objective function is:

MAX 18,000x1 - 5,000x2 - 0y1 - 30,000y2

and the constraints are:

s.t.

(1-0.25)200,000x1 + (1-0.40)300,000y1<1,500,000

x1 + x2 = 20

y1 + y2 = 4

The optimal solution:

x1 = 5.2; x2 = 14.8; y1 = 4; y2 = 0.

The optimal profit = 19,600.

SUMMARY

1. The ability to provide collateral is an effective constraint that sometimes limits the firm's ability to utilize credit facilities. Therefore, each financing or investment decision must be examined in the light of its implications for utilizing the constraint.

2. When choosing among the different loan possibilities at the disposal of the firm (including the possibility of financial leasing), not only must the cost of interest and due date be considered but also the level of collateral required.

3. If collateral is a constraint, any activity that requires collateral (such as the provision of guarantees) must be costed according to the loss of income that will result from decreasing the credit resources at the disposal of the firm.

4. If collateral is the constraint, it is in a firm's best interest to pay a premium for guarantees and thereby increase its collateral base, provided the premium is lower than the contribution to the firm that will result from increasing its credit resources.

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