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# THE NEW TECHNOLOGY OF FINANCIAL MANAGEMENT

Artificial Intelligence  
Expert Systems  
Intelligent Networks  
Knowledge Engineering

DIMITRIS N. CHORAFAS

# **THE NEW TECHNOLOGY OF FINANCIAL MANAGEMENT**

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**Dimitris N. Chorafas**



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*"Men accept Change only through Necessity.  
And they see Necessity only in Crisis."*

*Jean Monnet (1888–1979)*

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Dimitris N. Chorafas

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# Foreword

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Over the past 15 years, the globalization of markets in general, and of banking and finance in particular, has provoked a revolution in the use and application of high technology. Expert systems are no longer the exclusive domain of nuclear physicists or the military, but have become the essential tools of the successful banker. Constant evolution in systems is therefore a fundamental requirement for those institutions that wish not only to survive but also to prosper in the mainstream of today's changing marketplace.

It is widely accepted that one of the symptoms of this changing market environment is the fact that many banks operating independently today will be overwhelmed by their competitors over the course of this decade. Major takeovers and mergers are announced almost every few weeks. Some estimates say that as many as 75 percent of today's banks will be unable to remain independent until the year 2000.

As we embark upon the last decade of the millenium, this is obviously not the time to sit back and reflect. Diversification and innovation in quality services remain the rules of the day, particularly in the treasury, forex, and securities spheres—the engine room of banks, where astute planning and market perception can be brought to fruition with the aid of skilled guidance in the application of new technological methodologies.

In this book, Dr. Chorafas presents the reader—both technologist and financial professional—with not only such vital guidance but also a vision of technology as a friend rather than a foe in the challenges that institutions face.

I have had the pleasure of working with Dr. Chorafas on several projects in financial services, and, having experienced first-hand his innovative insight into the subject, I am certain that it will remain an essential work of reference for many years to come.

RANJIT DE ALWIS  
Director of Product Management and  
Member of the Management Board  
CEDEL  
Luxembourg

# Preface

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As the financial environment of the 1990s unfolds, the changes that it represents are deep-rooted. Some of the factors affecting this environment include the following:

- Evolution of the workforce
- Redistribution of wealth
- Advent of high technology
- Effect of the knowledge society as a whole

A wave of change is being driven by international economic factors in the capital markets, money markets, and foreign exchanges. The future bank is the *knowledge bank*—a leader in forex, securities, investment advice, and treasury operations. The same is true of financial operations in manufacturing and marketing.

But even if the present picture is a far cry from what treasury functions used to be only 10 years ago, this picture, too, could change. Managers and professionals of financial institutions must be alert to the dynamics of the market and eager to investigate the dominant direction of evolutionary developments.

A sound analysis of business opportunity should not exclude any reasonable possibility in the way financial services will be shaping up. Experimentation is the keyword today, and it can be successfully performed through



simulators and knowledge engineering constructs. Algorithms and heuristics are cornerstones of successful treasury and foreign exchange operations, as are distributed databases, market data filters, profile analyzers, and, most importantly, intelligent networks.

These are the issues this book addresses. It is designed for professionals who want to be at the top of their business and stay there, whether they come from a treasury, forex, and securities background or whether they have been trained as technologists.

The focal point of Chapter 1 is the organization that is necessary to support treasury operations. For this reason, it starts with a job description of treasury duties, emphasizing the importance of strategic planning in getting results, and ends with technological developments as well as the effects of automation on the treasurer's job.

Chapter 2 discusses the common infrastructure needed for treasury, foreign exchange, securities trading, and investment advice. It does so in a comprehensive manner, from the design of new financial products to the evaluation of the effects of taxation.

Successful trading needs both technology and knowledgeable people to use it. Chapter 3 takes a detailed look at the forex room, the steady evolution of its technological infrastructure, and the types of investments that are necessary in forex operations.

Some of these investments will be made in analytical tools. Chapter 4 goes into considerable detail in explaining what this approach involves, emphasizing the role of distributed heterogeneous databases, the need for seamless access to them, and some of the foremost solutions, exemplified by DAIS and MIA.

Trading in national and international markets requires increasing data flows, which are today sold for a price by information providers. The problem is not one of lack of data but rather of being snowed under by large data volumes pumped through monitors all day long. Chapter 5 describes the best approach to market data filtering.

The information that we buy, collect, and store in our databases must be examined not only critically but also analytically. Chapter 6 explains how this can be done, and brings the issue of interactive computational finance into perspective.

In a comprehensive manner, easy to follow for non-mathematicians, Chapter 7 explains the contribution of knowledge engineering and simulation. Chapter 8 underlines the fact that technology-based solutions are for the enduser. Therefore, they must involve agile human-machine interfaces.

The timely comprehension of market trends is one of the domains where technology can be most helpful. Chapter 9 focuses on intelligent charting

and pattern recognition but, as Chapter 10 suggests, new tools require a new culture in order to be used in the most effective manner.

The book concludes by placing emphasis on telecommunications and their significance in modern financial operations.

- Chapter 11 discusses the role that networks play in the globalization of financial products.
- Chapter 12 explains how networks should be designed for trading and for better client service.
- Chapter 13 introduces the concept of an intelligent network, outlining the services that it can offer.

Because of globalization, deregulation, and fast-moving technological evolution, we have no time to lose and no place to hide. A financial institution has no alternative but to master its technology.

No bank, no brokerage, no treasury business today has an inventory of large and stable profit-making sectors permitting it to hang on to its old connections. In fact, it has very few areas to depend on, and these are challenged all the time by the bank's own larger customers, who have now become its competitors. We have to develop new sources of income.

I feel indebted to a great number of bankers, corporate treasurers, forex operators, securities brokers, and technologists who contributed ideas as well as reviewed and commented on many parts of this book. The brilliant brains behind many of the leading concepts in this text have been Edmond Israel of the Luxembourg Stock Exchange, Heinrich Steinmann of Union Bank of Switzerland, André Lussi of CEDEL, Carmine Vona of Bankers Trust, Colin Crook of Citibank, and Gordon Macklin of NASD. To Eva-Maria Binder goes the credit for the artwork, typing, and indexing.

DIMITRIS N. CHORAFAS

*Valmer, France and Vitznau, Switzerland*  
*July 1992*

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# 1

## Developing the Organization and Technology to Support Treasury Operations

It is illuminating to look back to the Middle Ages or, for that matter, to the twentieth century's communist regimes. One of the characteristics of both epochs was that *conformity* was rampant. Another negative quality was almost total *intellectual stagnation*—and we can appreciate why the two go together and in the process stifle innovation.

One thing a chief financial officer cannot afford is intellectual stagnation in the operations under his or her control. Organization and structure in treasury operations should, of course, match the management style of the chief executive officer and of the board, but this should not be done at the expense of ingenuity in managing the finances.

With steadily changing financial markets the need to seize the moment is always present. At the same time, the treasurer of a bank or industrial corporation must make sure that the firm's financial staying power matches its market appeal, its product cycles, and its human capital requirements. This is necessary to ensure continuing profitability.

What sort of company needs treasury services the most? The First World currently features four types of enterprises:

1. Manufacturing and commercial multinational companies that are held by stockholders and that constitute a major part of the backbone of today's industrial, financial, and economic structure.

2. Financial industry organizations: commercial banks, investment and merchant banks, and insurance companies. These organizations may be publicly held, or may be partnerships, and they act as financial intermediaries performing many different tasks.
3. Manufacturing firms or financial institutions in the nationalized sector, which, in countries such as France, Italy, and England, control a major part of the economy.
4. The small-to-medium industrial and financial organizations ownership of which is divided between the public and private sectors. These organizations play a role in regard to the larger entities and their well-being, but are at the same time conditioned by the larger entities.

In all these organizations, the treasury function is critical. The treasurer's position is absolutely indispensable in the first type of organization; very important in the second type, though the position may be shaped in a different manner; tends to be confused with the making of the national budget in the case of the state super-market in the third type of enterprise; and identifies itself with the ownership in the fourth type.

## TREASURY FUNCTIONS

If all desired long-, medium-, and short-term funds could be borrowed from one lender, and all deposits handled in one only currency at one financial institution, the treasurer's function might be fairly simple. This is what some banks propose to industrial corporations through project financing, but this is not necessarily what the manufacturing or merchandising company should do.

The reason for the existence of the treasury is to provide the organization with an in-house means to optimize its global finances. This requirement highlights the importance of both the traditional and the more recently invented treasury functions:

1. *Financial planning.* This function includes planning the company's capital market investment program, as well as planning borrowing requirements. Other financial planning functions include forecasting cash receipts and disbursement, advising on dividend payments, and reporting financial results to the officers of the company.



2. *Cash management.* This comprises opening accounts and depositing funds in banks, administering money market instruments, paying company obligations through proper disbursement procedures, managing petty cash and bank balances, and maintaining records of cash transactions.
3. *Foreign exchange operations.* This requires keeping accounts in all major currencies, hedging to protect the company from exchange rate fluctuations, hedging with interest rate swaps and forward rate agreements, and investing in options and financial futures.
4. *Credit management.* This function includes determination of customers' credit risks, orderly handling of collections, management of cash discounts and terms of sale for prompt payment, and so on.
5. *Security flotations.* The treasurer must negotiate with investment bankers; evaluate and recommend types of securities most desirable for the company's borrowing requirements; and correlate these terms with the company's long-term ability to retire bonds, to make switches in capital market borrowing, and to repurchase or sell stock.
6. *Custody of funds and securities.* This duty encompasses provision of trustee functions, compliance with governmental regulations, handling of transfer agents, stockholder relationships, disbursement of dividends, relation with pension funds, and portfolio management.
7. *Other financial functions.* These include asset and liability management, income and cash flow estimates, hedging in futures and options, new financial instruments, links to clearinghouses, financial networking, trust management, custodian reporting, and contracting of loans and income.

The treasury must also keep balances; sign checks, contracts, leases, notes, bonds and stock certificates, mortgages, deeds, and other corporate documents; and collect, endorse, and deposit checks.

Because these job descriptions come from the practices of several corporations (banks as well as manufacturing firms), and since the treasury business is not standardized, some of the points overlap.

There is no single best way to organize the treasury function; actual organization must reflect a company's policies and practices. Yet all treasuries have common elements. One of the most basic is the operational and reporting requirement for funds management, shown in Figure 1.1.