INVENTING ORGANIZATIONS OF THE FUTURE: APPLICATIONS IN THE FINANCIAL DERIVATIVES INDUSTRY

by

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B.A. Economics, Brown University
(1990)

Submitted to the Sloan School of Management in Partial Fulfillment of the Requirements of the Degree of Master of Science in Management Master of Business Administration at the Massachusetts Institute of Technology June 1995

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ABSTRACT

Global risk management processes involve the creation, manufacture, and
distribution of financial derivative products which offer protection against
market volatility. A decomposition and specialization of the risk
management process reveals interesting ways to overcome the shortcomings
of product-mix choice, resource allocation, and customization in traditional
supply-chain management processes. First, since derivative production
consists of electronic settlement of cash accounts, the dependence on
warehousing and physical transport is eliminated, allowing first-order effects
of automation in shipping and payment. Second, value creation, and the
ability to maintain monopoly rents, depends on new product innovation that
captures individual customer profiles. In the absence of patent protection,
this industry-specific, product design process has taken the form of rapid and
frequent last-minute customization, which is made possible through
coordination-intensive organizations.

An important contribution of financial innovation, therefore, is the ability to
transform high-volume, batch processing jobs of a few products into a high-
volume, made-to-order jobs of many different products. Ultimately, the
acceleration and volume of financial derivative customization in the 21st
century may depend on the ability of securities firms to migrate to
organizations with:

(1) a high level of divisibility and compatibility of component parts, and
(2) efficient utilization and availability of risk capital inputs,
(3) information transparency of customer demands.

Thesis Supervisor: Prof. Thomas Malone

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Center for Coordination Science, MIT Sloan School of Management
DEDICATION

To all my teachers

To believers in technological innovation

To my family: Hwa Jin, Homoon, Bonnie, and Hyung Jun
Acknowledgements

This thesis is a culmination of many years of search for something to believe in. It integrates lessons learned in economics, finance, technology, and philosophy. I wish to acknowledge the following for being influential in the development of its creation:

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Rebecca Henderson - for first inspiring me about product development process through case studies; introducing me to theories on preemptive patenting, capturing complementary assets and maintaining a monopoly profits, and understanding sources of innovation as a system of technology imbalances

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My little brother -- who is not so little any more, but who served as a source of entertainment and "model" subject for observations on how the next generation of children embrace the technology of video games, animation, and computers in general

My truest confidante and sister -- whose unquestionable optimism, faith, and loyalty served as a constant, stable force; and who demonstrated the possibility of searching for alternative paths to happiness

Mom - for giving me the courage to question the status quo, lowering my tolerance for ambiguity, and for teaching me ways to independently develop resilience in the face of disappointment,

and Dad - for starting me on the road in pursuit of excellence, for constant exhortations to be productive, find meaning in life and contribute to society.

Thank you all, for being an influence in my life and work, and making me whole!!!
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INVENTING ORGANIZATIONS OF THE FUTURE: APPLICATIONS IN THE FINANCIAL DERIVATIVES INDUSTRY

1. Introduction

What are the sources of innovation in the financial derivatives industry? How can this process be improved and be made more efficient? And what organizational changes result from replicating product and process development globally in order to appropriate maximum rents? These are the questions we would like to answer in a multi-disciplinary thesis that involves understanding financial theory, technology strategy, information technology, and organizational behaviour.

Historically, the trajectory of technological and generational improvements in financial derivatives has been marked by a dialogue between regulators and financial institutions. The single largest contribution to modern finance was the creation of the traded options contract in 1976 at the Chicago Board of Trade. Since that path-breaking innovation, investment banks have entered into an era of ferment with multiple, incremental innovations in commodities, mortgage, foreign exchange, and interest rate markets. By the 1990s, Black-Scholes pricing theory, Cox-Ross-Rubinstein, and other lattice methods have become standardized methodologies and packages for seeking continuous arbitrage. First-mover advantages enjoyed by original developers have dissipated as agents carry out brokerage transactions.

Yet the Schumpeterian search for profit continues with the help of computer-aided, non-linear methods such as neural networking and chaos theory. Aside from pattern recognition trading models, second-generation derivatives, such as barrier options, knock-in and knock-outs, quantos, and basket options, have proliferated. The underlying purpose is to manage risk across time, distance, and markets.

What are the benefits of mapping out the coordination process in such dynamic organizations? If we view information as an input in the production process, there must be ways to design organizations of the future that can effectively manage the dependencies created for global distribution and coordination of new financial products. What kind of an organization can empower employees to take risks and make investment decisions conducive to innovation? What steps can financial institutions take to approximate patent protection and preserve its proprietary knowledge base?

This thesis gives a general background of the economics of financial innovation, followed by comments on the strategy of maintaining competitiveness among incumbent securities firms. A specific trajectory of new product development is examined in order to demonstrate the important factors for widespread adoption and to identify the set of organizational coordination processes that need to be managed for continued, successful profits. The goal of applying the methodology is to achieve corporate transparency on how businesses operate, as well as come up with predictive solutions on scenario-generating.
2. Background on Complex Global Coordination Process Project

Explanation of Coordination Science Discipline\(^1\)

This thesis was largely driven by sponsorship from MIT's Center for Coordination Science or CCS. The CCS' work focuses on three project areas: organizational structures, which studies how people work together and how this may change with new information technology; coordination technology, which designs and studies innovative computer systems that help people work together in small or large groups; and coordination theory, which is the development and testing of theories about how coordination can occur in a variety of systems, such as human organizations, markets, and computer networks. Coordination theory draws upon a variety of fields, including economics, computer science, organizational theory, information systems, management science, and psychology\(^2\).

Coordination science is the interdisciplinary study of coordination in many kinds of systems. The Center hopes that by classifying the dependencies patterns of coordination will emerge upon which to base a theory of effective management of dependencies. The Structured Thesis project was formed with partnerships between research fellows and graduate students, assigned to corporate sponsors in automotive manufacturing, telecommunications, aircraft engineering, health care, credit card issuers, and -- in this case -- financial securities.

Each sponsor agreed to serve as a host site for field work that would map a specific process related to the coordination of complex supply chain management. Individual research included reviewing literature in the field, gathering data about the site, and conducting interviews with company employees. The purpose of a cross-industry study was to populate the Process Handbook methodology with several different types of examples for comparison. The result would be to generate an "Answer Garden" for questions related to how best design an organization in the 21st century that could cope with changing requirements for coordination intensity.

Financial services had been massively implementing system computers for operations related to debiting and crediting accounts, and one particular interest for all of the sites is how information technology creates new opportunities for coordination across layers of separation and extreme outposts within the organizations.

2.1 Development of the Process Handbook

In order to advance the study of coordination science, Malone and Crowston developed methods for representing, classifying, and then analyzing processes in terms of their ability to coordinate, i.e. manage dependencies. Out of this work has come the Process Handbook.

To understand the effects of information technology on an organization and coordination costs, Malone and Rockart developed a predictive framework with three

---

\(^1\) Attributed to William Lyon, Master's Student and fellow Structured Thesis colleague

\(^2\) [http://www-sloan.mit.edu/ccs/research.html](http://www-sloan.mit.edu/ccs/research.html)
orders of effect.\(^3\) The first order effect - automation, information technology will automate coordination tasks and substitute for human activity. The second order effect - increased coordination, information technology gets applied to coordination so as its costs go down, the overall amount of coordination may increase. The third order effect - coordination intensive structures, will arise as costs decline and adoption spreads more "coordination-intense" structures may evolve. This has several implications: operations that require a great deal of coordination (virtual corporations, geographically dispersed teams, etc.) may become possible; and, the scale of a coordinated activity can increase dramatically.

The first phase of development focused on the representational methodology and software support. Refinements in these areas continues and is intended to serve as a transcript for reading organizations, similar to the way an orchestral score is used to interpret the conjunction of different instruments in music. The second phase of the development focuses on collecting example processes from organizations. This latter phase generated this structured thesis project. By comparing these dependency managing processes and by having a catalog from which to chose established processes, CCS intends the Process Handbook to help create new processes, or to show how different processes might be applicable in new situations.

2.2 Process Handbook Methodology and Terminology

The Process Handbook attempts to represent and catalog varied business processes to achieve two goals: to help theoreticians imagine new organizations and to help consultants, managers, and others redesign existing organizations. The key challenge is devising a notation or representation method for describing processes in such a way that they can be indexed and clearly understood. In order to do this, the process handbook leverages ideas of inheritance from software design and dependency management from coordination theory. The sections below elaborate on the terminology, representational tools and the analysis methods from the Process Handbook.

The real value begins with a clear understanding of the terminology used in the Process Handbook. These distinctions capture how this methodology creates a more robust way to represent processes and their embedded dependencies than alternate systems.

## COORDINATION PROCESS TERMINOLOGY

<table>
<thead>
<tr>
<th>Terminology</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>A process is a set of activities to accomplish an objective.</td>
</tr>
<tr>
<td>Decomposition</td>
<td>Decomposition is the idea of splitting an activity into component sub-activities. This procedure can go through several iterations to further decompose sub-activities into their constituent activities.</td>
</tr>
</tbody>
</table>

In general, decomposition of an activity represent Boolean "and" relationships. To complete an activity, each of its components must be accomplished. For example, the activity "pay for purchase" includes several sub-activities "determine amount" and "give amount to seller."

This procedure creates generic sub-routines of activities in a process that may be linked to other process, i.e. re-using sets of components elsewhere in the Process Handbook. They may be ordered sequentially based on prerequisites.

<table>
<thead>
<tr>
<th>Inheritance</th>
<th>This term adopts the meaning used in traditional object-oriented computer programming. In this paradigm, different classes are created. Each class has a set of characteristics that are automatically &quot;inherited&quot; by any sub-class or specific object created in that class. Sub-class start with the common characteristics yet may be modified with further characteristics. Objects &quot;inherit&quot; characteristics from those above them in the hierarchy. These characteristics form a base of common elements that may then be modified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specializations</td>
<td>In general, specializations represent Boolean &quot;or&quot; relationships. Specializations offer alternate processes to accomplish the same activity. For example, the activity &quot;pay for purchase&quot; could be done at least by at least three specializations: pay with cash, pay with check, or pay with credit card.</td>
</tr>
</tbody>
</table>

A high-level activity may decompose into generic sub-activities. The specializations of the high-level activity each inherit a copy of the activity’s decomposition, i.e. the generic sub-activities. Thus each specialization starts with a basic decomposition. These get modified to reflect the unique characteristic sub-activities of each specialization. Thus in the "pay for purchase" example above each of the three specializations would inherit the same decompositions.

| Dependencies   | Dependencies describe the linkages between activities in a particular process. Of particular note, each dependency requires some method of coordination to be managed successfully. |
2.3 Representation Tools

Activity Lists

An activity list is simply a chart that provides the opportunity to define the elements of the activities. The following template for an activity list contains headings for who the actors are and what the goals for each activity are. Artifacts consist of documenting the way the process is handled currently. Context includes describing the skills required, shared resources, and evaluation criteria that the activity depends on.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Actor</th>
<th>Goal</th>
<th>Artifacts</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The type of dependency created can belong to any of the following list of basic dependencies.

List of Basic Dependencies and Alternative Coordination Processes

<table>
<thead>
<tr>
<th>Dependency</th>
<th>Examples of coordination processes for managing dependency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared resources</td>
<td>“first come/first serve”, priority order, budgets, managerial decision, market-like bidding</td>
</tr>
<tr>
<td>Producer/ consumer</td>
<td>notification, sequencing, tracking</td>
</tr>
<tr>
<td>(Prerequisite constraints)</td>
<td></td>
</tr>
<tr>
<td>Producer/ consumer</td>
<td>inventory management (e.g., “Just In Time”, “Economic Order Quantity”)</td>
</tr>
<tr>
<td>(Transfer)</td>
<td></td>
</tr>
<tr>
<td>Producer/ consumer</td>
<td>standardization, ask users, participatory design, concurrent engineering</td>
</tr>
<tr>
<td>(Usability)</td>
<td></td>
</tr>
<tr>
<td>Simultaneity constraints</td>
<td>scheduling, synchronization</td>
</tr>
<tr>
<td>Task/ sub-task</td>
<td>goal selection, task decomposition</td>
</tr>
</tbody>
</table>

According to Pentland, Osborn, Wyner, and Luconi\(^4\), the basic idea is very simple: whenever there is a dependency between two production activities, coordination is required. At the same time, every dependency creates an opportunity for choosing among alternative coordination mechanisms. The activity representation provides a first cut at understanding process components and the decomposition/specialization relationships between them. Given the continuing decrease in the cost of technologies that support coordination (e.g. computers and telecommunications), it is often possible to make considerable improvements in the design of a process simply by focusing attention on the dependencies between activities and the coordination processes used to manage them.

\(^4\) Useful Description sof Organizational Processes: Collecting Data for the Process Handbook, February 1994, CCS, MIT
Process Maps

These represent processes as objects arranged in a hierarchical network with general activity categories at the top and increasingly specialized kinds of sub-activities as objects at lower levels. The lower levels inherit the decomposition characteristics of the upper levels. Decompositions flow down. Solid lines represent this flow. Specializations flow to the right. Dashed lines represent this flow. A heavy arrow shows the dependency between sub-activities.

Sample Process Map

In the sample process map above, the activity “pay for purchase” decomposes into two sub-activities “determine $” and “give $.” There are three specializations which can be used to pay for the purchase: pay cash, pay check, or pay credit card. Each of the specializations inherit the two sub-activities (though not shown in this diagram).

2.4 Process Handbook Database and Application Software

Documenting processes shows how people work together. Analysis looks at best practices and speculates how people might work together differently with new kinds of information technology. Diagramming a process demonstrates the dependencies between activities. After mapping a process, analysis of the activities or of the dependencies may reveal opportunities to improve process effectiveness in accomplishing its goal. Then the processes used to manage those dependencies can be identified and represented as well. The Process Handbook serves as an electronic and printed library of examples using a common taxonomy.

The CCS is also sponsoring the development of an application that will create a database and representation of process maps through front-end field entry. Visual Basic, a Microsoft Windows development tool, served as the development platform for this application, where activity lists and description screens for each object pop up to be filled in. The storage of items in a database could allow manipulation for comparison across industries. Also, animation of the process flow timing could be used to demonstrate the convergence and separation of decision paths.
2.5 Introduction to Site and Point of Entry

The host organization is a global financial services conglomerate with a branch network of 256 domestic offices, headquarters at a major international financial center, 41 banking subsidiaries, and 54 international locations.

The firm is engaged in active marketing and distribution of financial derivative products globally, and executes transactions from the trading floor through a computerized trading system that is being restructured for better risk management evaluation. The point of entry came through the Chief Financial Officer in the North America Regional Management in New York. At the time, a new initiative for a risk measurement was being undertaken to give a snapshot glance of overall risk in trading positions worldwide. The purpose of quantifying this measurement was to better manage the internal risk system of the firm, and to serve as a report that offered instantaneous income explanation on a daily basis. Information on the maximum range of capital being tied up within 2 standard deviations is used not only as a strategic tool to check inventory, but also to give comfort guidelines on how much more risk can be taken without affecting the firm's triple-A credit rating. It is an effective management control tool that can compare the relative risk and returns across a portfolio of businesses, which can then serve as an objective evaluator of trader performance.

The interviews originated from the area of finance and control which is interested in the function of accounting for profit and loss statements, and the monitoring of internal risk management of the company. The research then extended into one division involved in creating derivative products for external clients who want risk management themselves. In keeping with the cross-disciplinary approach of the thesis, I interviewed traders, salespeople, theoretical researchers, applications developers, financial controllers, IT infrastructure specialists, back-office operations staff, new product development team members, and implementers of consistent, high-quality, global deployment of risk management software. Speaking to these individuals results in gathering artifacts about the following:

- Profit & Loss reporting
- Risk management process philosophy
- Actual technical implementation of global operations
- Procedures for new product innovation

Combined together, they give a more complete picture about overall competitiveness and management of profitability. Now we turn to a literature review about the driving force for competitiveness: identifying sources of monopoly profit in the financial derivatives industry.

3. The Incentives and Sources of Financial Innovation

In his survey article "Financial Innovation: The Last Twenty Years and the Next", Nobel Prize-winning economist Merton Miller refers to the discipline of statistics in defining what an innovation is:
Time-series analysts break into two parts the change over time... One part is the change that could, in principle at least, have been forecasted by extrapolating known past information. The other part is thus the unanticipated, unforecastable change, the "surprise", as it were. It is these surprises that have been aptly dubbed the "innovations" in time series.

Miller goes on to hypothesize that the process that stimulated new and energized innovations in finance for the past twenty years stems from responses of firms to taxes and regulations. As it turns out, several other theories on the incentives for why innovation occurs have also surfaced, and one purpose of this paper is to examine these incentives for innovation in the financial industry. Taking the objective of a financial firm to maximize profits subject to revenue-generation and cost-reduction constraints, I describe the forms that some of these innovations have taken place. Later, I examine in greater detail the rapid customization of a particular derivative instrument and summarize how this product fits in with the theories.

3.1 Description of New Financial Instrument Types

As mentioned in [Von Hippel 1988], the classical reason for financial innovation stems from Schumpeter, who said that in a capitalist economy, the incentive for entrepreneurship has been the ability to capture economic rents in the form of monopoly profits. In economic theory, innovation takes the form of a change in the shape of the production function. [Schumpeter 1939], and later, [Utterbach 1987] categorize innovations as being either "process" or "product". Process refers to innovations that permit an existing product or service to be provided more cheaply. Product refers to innovations that introduce a product or service that was previously unavailable. Ross confirms in "Institutional Markets, Financial Marketing and Financial Innovation" that the largest contributions to finance fall under product and process innovation:

(1) The creation of new derivative securities such as forwards and S&P futures, exchange-listed put and call options, convertibles warrants, strips, and swaps.

(2) The dynamic trading strategies that make heavy use of these new instruments such as basket and program trading that have just as dramatically changed the areas of money management and financial decision making.

Thus the range of financial innovations go from electro-mechanical devices in the back-office operations of large money-bank centers and automatic transaction execution systems on international stock exchanges to the creation of intangible products which capture the slightest of differences in quoted rates among listed assets.

3.2 General Incentives for Financial Innovation

Innovation has been a hallmark of the financial service industry. Yet these innovations have not been created out of virtue or generosity. As with any other economic behavior in a capitalist economy, individuals behave rationally by trying to maximize their utility in anticipation of material gain [Flood 1992]. In response to the
pace and diversity of financial innovation, researchers [Pierce 1984] outlined some general incentives:

(1) the creation of differentiated asset products with characteristics previously unavailable,
(2) the desire for institutions to avoid reserve requirements,
(3) and finally, lowered transactions costs for the purchase and sale of assets.

**Asset Substitution for Products with Different Liquidity Characteristics**

[Milbourne 1986] argued that of these, the most general description was the asset substitution aspect. That is, in a multi-product world where economic agents (or portfolio managers) can substitute assets across a spectrum of liquidity characteristics, there is constant trade-off between price and the degree of uncertainty behind receipts and disbursements. Thus, a major incentive for the creation of financial derivatives has been the demand for derivative products which yield higher rates of return. It is the competition for higher-yielding substitutes that has led to the search and creation of more highly-liquid products, with lower transaction cost characteristics. For example, one reason why depositors hold savings accounts in addition to comparably higher yielding CDs or mutual fund accounts is that the savings account provides a ready source of funds if unexpectedly large payments must be made. Lower return is offset by the lower transfer costs and easy liquidity.\(^5\)

**To Round Out Incomplete Markets**

In addition to substituting assets with different liquidity characteristics, financial innovation can take on the role of completing “incomplete” markets with products having characteristics previously unavailable. In a very famous example, Milton Friedman was not allowed to profit from his belief in the early 70s that the pound sterling was going to devalue because no bank was willing to undertake a transaction of selling the pound short, so a formalized international money market was created to address his need at the Chicago Mercantile Exchange (CME). So another reason for financial innovation is to fulfill a market need for products that would bridge interrelated markets and allow consumers to enter into transactions that monetize their beliefs about where interest rates are going or summarize their risk preferences. It can be argued that what once were rudimentary financial markets has developed into sophisticated financial “supermarkets” --- to draw a metaphor --- arising from filling out a variety of merchandise to satisfy increasingly personalized or customized preferences.

**Product Differentiation Demand from Customers**

[Von Hippel 1988] suggests that technological innovations often come from functional role switching between manufacturers, suppliers, and users that face a

\(^{5}\) Another issue that Milbourne mentions that is discussed elsewhere [Hester 1981] is the instability caused by financial innovations on monetary policies. He argues that "the number and timing of various innovations ... makes it impossible to empirically disentangle and evaluate their numerical affect" on monetary aggregates. This gives a sense of the reason for regulatory restraints that have characterized the stop-and-go progress of innovation in finance.
common barrier in their relationships. The two necessary preconditions for innovation
derive from a Schumpeterian reasoning that a company must be able to capture rents
from its knowledge base, and that any difficulties encountered in the sales,
organizational, and production infrastructure cause the firm to develop its own
infrastructure. In the previous example, Friedman was the user who instigated change
by a shift in frameworks, but more typically, the existing players are the investment
bank 'manufacturers' who distribute the products to institutional 'customers' through a
wholesale and retail sales network.

In primary markets, when financial products are newly issued, investment
bankers not only serve as manufacturers but as suppliers as well, although in
secondary markets, institutional investors serve as both suppliers and buyers of
resold products. In either case, investment banks serve the role of running marketing
networks for sharing of information know-how, or "reverse engineering", as it is
referred to in the industry. What happens in this case is that fund managers seeking to
rematch duration and convexity characteristics of their portfolio solicit competitive bids
amongst several of the bulge bracket investment firms on Wall Street to fill in the slot
for an asset that fits specific financing criteria.

Thus, just as an apartment searcher would check rental agent listings and
compare across housing stock, large investment fund clients would go shopping
amongst the inventory of Wall Street banks for securities based on a particular
collateral credit rating and yield behavior. This would be accomplished by soliciting
pricing from several salespeople at competing banks, at times including surreptitious
faxing of documents back-and-forth to compare similarly existing derivative bonds.
However, synthetic bonds differ significantly from housing stock in the sense that their
characteristics can be altered by combining two or more products. Thus it would be
unusual practice for an investment bank to back out or "reverse engineer" the structure
of a competitor's product in order to compete on price, and this was how informal
information-sharing took place. Alternatively, information on innovations could be
gleaned by subscribing to publicly available electronic listing devices such as
BLOOMBERG or even by asking for prospectuses once the securities had been
registered with the respective government agencies.

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6 [Ross 1989], p.544
7 Product use (in Uterbach's terminology) is widespread enough that 25 years after the first exchange-
traded future was created standard vanilla formats now exist so that the specific pattern can be detected
by observable variables such as coupon, maturity, and payment window.

8 A typical responsibility for a trader to keep abreast of the market of the particular product was to search
on TELERATE Knight-Riddor or Reuters screens for preliminary data reflecting the launching of a new
deal. Sometimes in the interest of protecting anonymity and to give the banks a chance to market
proprietary products to clients, the information service providers could delay postings for 1-2 days so that
exact profit margins could be sufficiently hidden. In addition, most large investment banks keep a full
research staff with a 15-20 head count (roughly $2 -3 million in payroll) dedicated to building a
knowledge database of all publicly available securities. The critical assumption is that information is
only useful close to or before pricing, since information loses significance proportionately with time
after the sale.
This practice of users shifting functions into suggesting the manufacture of goods is entirely consistent with the idea that "lead users" drive innovation. Thus, in this hypothesis, financial innovations arise to meet a perceived demand for new financial services. Just as toy and clothes manufacturers undergo cyclical demand for fashionable fads, financial products also undergo ups and downs of popularity. The recent alphabet soup of fixed-income products -- LYONs, CATs, TIGRs, and COLTs -- should be indication enough of the financial zoo that has emerged.

**Improving Products to Insulate Risk and Reduce Instability**

[Flood 1992] claims that financial innovation has been motivated by the imperfect success rate for new securities, such that the process of contract design in securities markets has been marked by the need to improve financial products. For instance, Minsky\(^{10}\) identified a self-reinforcing loop where financial innovation leads to greater instability and therefore leads to a desire to come up with better instruments that insulated themselves against default. This happens when banks increase their willingness to extend credit and individuals increase spending because of their newfound confidence in rolling over debt (e.g. credit cards). Thus, although financial innovation gives investors a wider choice of instruments to accommodate their preferences for risk, market forces reject product designs that do not follow principles of financial theory in favor of successful products that do. Therefore, in this sense, financial innovation is a self-insuring cycle of trying to improve upon existing products to redistribute risk and control the effects of instability.

**Response to Regulation and Taxes**

Most of the time, financial product innovation has been thought of as a by-product of the evasion of regulation and taxes. Most of the critical regulatory frameworks that supply the motives for financial expansion were put in place during the Great Depression when survival was a more pressing concern. Since the return of world wealth in the 1960s, interest rate ceilings, fixed foreign exchange restrictions, and antitrust controls have become binding constraints that creative financiers have tried to break out of.\(^{11}\) [Minsky 1986] first identified a natural movement toward speculative and Ponzi financing arrangements during business cycle upturns. He adds that the additional layering of finance through new instruments that make credit available by tapping pools of liquidity promote greater fragility in the financial structure. This new product creation is backed by modern finance theory, where securities can be used to transfer income from one instrument to another - in particular, higher taxed forms to lower taxed ones. Thus the explosion of financial derivative instruments can be credited partly to global prosperity and burgeoning desire to expand out of restrictive controls. In fact, governments have responded by continuously shifting the structure to blunt the force of previous successful innovations.

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\(^{9}\) See [Bodie, Kane, and Marcus]. Japanese clients of recent are keen on being the first to acquire prototype exotics of never-before-seen products, and are willing to pay a premium for such a novelty.

\(^{10}\) [Carter 1989], p.780

\(^{11}\) Many agree that high interest rates and regulation stimulated the creation of money market funds, which lend money on the overnight Fed funds market, and NOW accounts, which draw interest earnings upon checking accounts.
by taxpayers. The endless back-and-forth sequence of action and reaction was dubbed the "regulatory dialectic" by Edward Kane of Ohio State University [Miller 1986] and has unsuspectingly been the cause of even more opportunities for innovation.

Along with these changes has come an enormous increase in the demand for the services of financial economists not only to value the new instruments and the new strategies but to design them as well. Thus, like industrial engineers, financial engineers use the techniques of modern finance to build the financial equivalent of technical breakthroughs, forming a valuable group in the value-chain of financial production.

**Lowering of Transactions Costs**

The opposite of increasing revenue to generate profits in financial innovation is to reduce the costs of staying in business. Financial institutions such as mutual funds, institutional investor firms, or banks (the "customers" in the financial industry) maximize their objective function subject to existing constraints and react when there is an increasing cost of adhering to them. These constraints can be opportunity costs in the form of higher-yielding debt or equity instruments or actual costs of operations.

The ATM (Automatic Teller Machine), for example, is a product and process innovation that reduces banks' transactions costs. An ATM provides many routine services, such as accepting deposits and disbursing withdrawals, and usually does so more cheaply due to economies of scale from automation, rather than through maintaining a payroll.\[12\]

The need for an efficient way of supplying the service of "immediacy" in carrying out transactions has been the rationale for the existence of the open-outcry method of futures trading at the Chicago Board of Trade (CBOT) for years. A direct result of the revolution in computer technology and data processing has been the reduction of asset transfer costs. Thus, the old system has been superseded by electronically-wired brokerage services at the NYSE and Commodities Futures Trading Commission (CFTC). The contributions of communication technology in the integration of decentralized markets across geographically-disperse and separate time-zone locations is an example of process innovation resulting from the speeding of information flows.

Three reasons explain why this phenomenon occurred. First, consolidated reporting of transactions reduced the time delays to price discovery and provided welfare gains to society through a consumer surplus argument [Garbade and Silber 1978]. Thus, there were gains to the one sector of consumers in financial markets -- portfolio managers -- who experienced lowered transactions costs of delivery (i.e., shipping, fees for making payments in different countries, fees for sending transaction instructions). A secondary effect of this faster knowledge diffusion is of lowering the cost of liquidity services by reducing the cost of searching for the best price in alternative markets. Lastly, a more subtle effect is that of simplifying

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\[12\] At the same time an ATM can provide services that were previously unavailable, such as nighttime and weekend withdrawal service [Flood 92].
savings/investment decisions for consumers who could now easily distinguish what inter-market price differentials existed in foreign exchange currencies, through the help of their brokers.

3.3 Survey of New Financial Instruments

Now that we have talked about the incentives for financial innovation and identified the functional sources where these products or processes can originate, I can cite a remarkable and concise study that surveys 38 new financial products created from 1970 - 1982. [Silber 1983] undertook an empirical investigation to record new products and practices mentioned in trade publications which is presented in TABLE 1. This database was intended to identify common variables or exogenous forces that influenced financial constraints. Each of the column headings represent a variable:

1. Inflation (a) Level of interest rates (b) General price levels (c) Tax effects
2. Volatility of interest rates
3. Technology (i.e. information processing and data transmission)
4. Legislative initiatives identified with Congress and federal agencies
5. Internationalization from the expansion of foreign trade, floating exchange rates, and commodity cartels, and
6. Other reasons.

TABLE 1 - Financial Innovations (1970-82)

<table>
<thead>
<tr>
<th>Types</th>
<th>1 (a)</th>
<th>1 (b)</th>
<th>1 (c)</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td><strong>A. Cash Management</strong></td>
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<td>1. Money Market Mutual Funds</td>
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<td>2. Cash Management Accounts</td>
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<td>3. Money Market Certificates</td>
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<td>4. Debit Card</td>
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<td>5. NOW Accounts</td>
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<td>6. ATS Accounts</td>
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<td>7. Point of sale terminals</td>
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<td>8. Automated clearing houses</td>
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<td>9. CHIPS (same-day settlement)</td>
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<td>10. ATM (Automated teller machines)</td>
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<td><strong>B. Investment Contracts</strong></td>
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<td>1. Floating Rate Notes</td>
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<td>2. Zero-coupon bonds</td>
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<td>3. Stripped Bonds</td>
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<td>4. Bonds w/put options (Warrants)</td>
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<td>5. Floating Prime Rate Loans</td>
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<td>6. Variable Rate Mortgages</td>
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<td>7. Commodity Linked Bonds</td>
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<td>8. Eurocurrency Bonds</td>
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### 3.4 Analysis of Current State of Financial Innovation

According to [Utterbach 1987], firms undergo three shifts in the competitive emphasis of innovation: (1) functional product performance requiring higher levels of output and productivity, (2) product variation where opportunities are created by expanding technical capability, and (3) cost reduction, where incremental changes are made. These 3 stages correspond to a fluid pattern, followed by a transitional pattern,
as the market develops, and finally, a specific pattern of behavior when the market stabilizes:

In the fluid phase of a firm's evolution, the rate of product change is expected to be rapid, and operating profit margins are expected to be large. Few existing competitors will be either small new firms or older firms entering a new market based on their existing technological strengths. A firm might be expected to emphasize unique products and product performance in anticipation that the new capability will expand customer requirements. The new product technology will often be crude, expensive, and unreliable but will fill a function in a way that is highly desirable in some market niche. Prices and profit margins per unit will be high, because the product often has great value in a user's application.

Technology to meet needs will come from many sources, including customers, consultants, and other informal contacts, because fluid units tend to rely heavily on diverse, external sources of information.

As both producers and users of a product gain experience, target uncertainty lessens and product innovation enters the transitional state. The usefulness of the new product is increasingly better understood, and may take on a variety of new forms to serve other parts of the market. Additional improvements and innovations incorporating new components and systems concepts may be required to expand its possible uses and sales. A greater degree of competition based on product differentiation usually develops, and dominant product designs may begin to emerge.

As obvious improvements are introduced, it becomes increasingly difficult to better past performances. Users develop loyalties and preferences, and the practicalities of marketing, distribution, maintenance, advertising, and so forth demand greater standardization.

The reduction in target uncertainty that comes from greater diffusion of product use allows a correspondingly greater degree of technical uncertainty to be tolerated. Therefore, larger R&D investments will be justified - for advanced technology will become a major source of further product innovation.

Judging from the [Finnerty 1988], which documented 32 more improvements in debt financial products and 18 new preferred/convertible/equity instruments, financial innovation up to the mid-1990s can be characterized as having gone past the transitional stage in Utterbach's framework. In fact, massive diffusion in the mid-to-late 80s has reduced the uncertainties of a dominant design, and product innovation has progressed to lower value-added, incremental innovations which try to incorporate cosmetic changes. Now, financial innovation in derivatives has approached the characteristics of cost reduction not only because of extreme competitiveness among competitors due to standardization and stabilization, but also because of increasing wariness among users about the riskiness of the derivative business \(^{13}\). Thus, it is fair

\(^{13}\) From 1993-95, a string of negative publicity in the press aided in a growing movement against the use of derivatives. These included the resignation of the chairman of Salomon Brothers for accusations from the Federal Reserve Bank of New York of rigging hiddings for Treasury securities; the eventual sale of Kidder, Peabody by GE due to faked losses by a trader in the Government securities division; lawsuits from Procter & Gamble and Gibson's Greetings against Bankers Trust for allegedly failing to disclose all the risks involved in certain interest-rate securities; the bankruptcy of Orange County, California due to investments in inverse-floating instruments which took a hit from the Fed's 3-time, 75 bp increase of Fed Funds rates; and last but perhaps most ignominiously, the collapse of Baring Securities PLC -- a London brokerage firm due to losses from a trader of index arbitrage of Nikkei Futures in Singapore. An influential piece by the ex-chairman of NY's Fed in *Fortune* magazine sounded alarms about an unstoppable chain reaction because of the interconnectedness of international banking communities.
to say that R&D investments among investment banks may be justified and even flourish, since the product has reached some form of establishment. The search for the next great source of further product innovation\textsuperscript{14} will occupy the use of much venture capital, as it has for other high-tech industries like pharmaceuticals and consumer electronics.

The current status of financial innovation is on the cusp of market saturation and technological revolution, since their is a need for suppliers to lift the industry beyond narrowing profit margins. Maintaining a constant R&D pipeline to new products is part of managing a portfolio of businesses to guarantee a future stream of income, although caution must be put in to keeping the leading edge for as long as possible. The industry will probably be split between technological innovators, who have the comparative strengths in market share and capital to maintain an R&D strategy, and a field of technology followers, who will depend on concentrated distribution networks to diffuse standardized products.

\textit{The Nature of Competition Among Investment Bank}

Unlike industrial firms where patents can be granted, financial industry ‘manufacturers’ cannot patent their processes or products. Because of the highly-regulated nature of the industry, investment banks differentiate themselves through the quality of their service and rely heavily on relationships and loyalties. They may rely on marketing strategies such as brand-naming to improve product line visibility, but essentially, financial engineers are bound by federal laws that require any radically different product to receive consent from Washington. Thus, the few top firms on the vanguard of cutting-edge product R&D do so incrementally to respond to client wants and needs. However, proprietary know-how developed in-house cannot be kept secret indefinitely, because the securities ultimately have to be registered with the SEC or some regulatory body for public consumption, and the documentation usually takes the form of a detailed prospectus \textsuperscript{15}. The most crucial period is the time shortly before releasing information publicly.

Therefore, generic product definitions are widely known and distributed because they are not considered vital, but the most closely-guarded data is the pricing information at which securities are sold, plus the client list to which those were sold to. Thus, there is never any direct contact between trading desks for new products\textsuperscript{16}. Any know-how trading that takes place during the critical time is covert, secret activity through persuasive conversations with any one of three third-party agents: (1) regulatory officials who receive direct information for approval, (2) accountants who

\textsuperscript{14} Bob Merton, in his "Continuous Time Finance" class at Harvard Business School, calls this the search for the 'money machine'.

\textsuperscript{15} These are gone over tirelessly by rounds of professionals, followed by consultations with lawyers to verify any disclaimer language in case of losses, as well as accountants to double-check the numbers.

\textsuperscript{16} Informal personal contact does occur more frequently in secondary markets in crisis situations, when traders are forced to make delivery of products they do not have in inventory. Mutually beneficial trades are made as a ‘favor’ that leaves an obligation to return the favor at some future date [Von Hippel 1988, p.77]
verify numerical figures, and (3) clients who are either auctioning or bidding for securities.

Any information that is divulged is probably "leaked" inadvertently, because it is fairly simple to reverse engineer a structure if you know the yield profile given real-time observable figures such as the current yield curve, plus a couple of other readily-available statistics such as coupon, term to maturity, and average life. After a deal is done however, the news is widely dispersed on public news wires and information services such as the Dow-Jones TELERATE. Within two weeks, the entire structure enters the Bloomberg database, with specific dollar amounts and payment instructions. Thus, the primary issue market for investment contracts in New York seems to fit with Von Hippel's description of aerospace engineers bidding for a government contract. Information is withheld temporarily because the value of a proprietary know-how offers significant competitive advantage, but is freely shared after the winner has been announced.\(^{17}\)

Before this happens, though, the information takes on double meaning not just because the structure becomes transparent, but because the fact that a competitor is doing a deal means that there is demand and profit to be made. This latter effect becomes increasingly important under more competitive scenarios when the limited piece of business crowds out suppliers who are not the first to sniff out opportunity. Thus, trade secrets are not a good basis for licensing non-embodied innovation knowledge, because there is no legally protected monopoly, and because there is no recourse for action against imitators who can recreate the product independently. Why then would an investment bank go through the trouble of innovating on a derivative product?

**First-Mover Advantages and the Risks of Financial Innovation**

We have seen that in the financial industry, the holder of trade secrets cannot prevent independent discoverers from taking advantage of product innovations indefinitely. It is not possible to practice "potting" \(^{18}\) or destroying the information-content when a packaged seal is broken, since derivatives are intangible. A lengthy court battle between competing investment banks trying to prove stealing of ideas is highly unlikely, since information is widely dispersed.

According to [Tufano 1989], investment bankers estimate that developing a new financial product requires an investment of $50,000 to $5 million in legal, tax, accounting, and regulatory fees, excluding a $1 million payroll to staff product development groups. Furthermore, investment bankers risk their careers and millions of committed dollars to develop computer systems to support market-making activities. Are these actions justified even when the SEC demands that they reveal product design and rivals can easily free-ride off the innovations of others?

\(^{17}\) In fact, the sharing is so complete, that in competitive private bids for mortgage portfolios (which serve as input in the CMO production chain), not only does the auctioneer inform all the players which party won, but they also provide a ranking that tells them the amount by which they lost.

\(^{18}\) [Von Hippel 1988], p.54
In the previous section, we saw how there was no "tight appropriability regime" and how easy it was to imitate competitors' products\textsuperscript{19}. It was found that imitators invest 50 - 75% less than innovators to create imitative products. The profitability of an innovation to its original designer declines over time and a profitable innovation invites others to enter the marketplace with like products. As this occurs, innovator profits erode. This puts into question our original hypothesis that firms innovate for temporary monopoly profits, unless pioneers can command first-mover advantages of charging higher prices before the entry of rivals. If so, innovators can recoup the investment to innovate, but the ability to continue charging higher prices rests on customers' perception of whether the pioneer has extra quality or added-value, or if switching costs lock in customers to the higher prices\textsuperscript{20}.

4. Maintaining a Persistence of Monopoly in Innovative Financial Products

We have analyzed the proprietary nature of the finance industry in developing new products and described the current state of sophistication in the evolution of derivatives. Now we are ready to discuss the development of a specific derivative product to see why it came about.

In the Tushman and Rosenkopf framework of technological change, the functioning of the financial risk management industry can be characterized as a complex open system composed of multiple subsystems that are linked together through interface technologies. The production of innovative financial products, therefore, consists of networked components working together over a distance, the coordination of which implies a tacit knowledge-base. One purpose of this paper is to formulate a technology strategy which aids in the persistence of monopoly in a financially innovative product. That is, it deals with identifying the sources of financial innovation and solutions for extracting and maintaining monopoly rents from developing this technology.

Before we begin, one must have a thorough understanding of why firms want to enter this market, where the money is, and how the production process works. After a generalized description of the business and factors which promote widespread diffusion, we trace the pattern of innovation for convertible security equity derivative products. Ultimately, we would like to give recommendations for what incumbent firms could do to maintain a leading position, and what implications there are to coordinate the complex global process of distributing these new products.

4.1 Description of Business

Financial risk management products consist of the packaging and delivery of information -- financial information. Investment banks and securities firms are in the business of brokering resources between the borrowers and lenders of our society, and profitable firms are able to develop a core competence around repeated sales due

\textsuperscript{19} We could even draw an analogy of derivative innovation to lip-singing karaoke, since it would be easy to observe, recreate and repackage bootleg products.

\textsuperscript{20} Schmalansee and Klemperer from [Tufano 1989]
to relationship-specific assets. It is not easy to accomplish this, since it means trying to lock contractual parties into a relationship where it would be costly to switch trading partners [Besanko, Dranove, Shanley, in press]. In an efficient free-market, where no loyalties are eminent, the creation of mutual dependencies between buyers and sellers of innovative financial products can therefore be a source of competitive advantage.

**FIGURE 1 - VALUE CHAIN OF FINANCIAL SERVICE**

<table>
<thead>
<tr>
<th>INFORMATION RETRIEVAL (Raw Material)</th>
<th>INFORMATION MANAGEMENT (Refining)</th>
<th>INFORMATION DELIVERY (End-product)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACTIVITY</strong></td>
<td><strong>MECHANISM</strong></td>
<td><strong>SALES &amp; SERVICE</strong></td>
</tr>
<tr>
<td>Financial News Gathering (i.e. stock reports, interest rates, inflation)</td>
<td>Distributed computing, Groupware software to share data and process, Graphical user interface applications, inter-office communications, seating arrangements</td>
<td>Direct Sales Force, 24-hour customer hotline, Communications devices (internal), Advertising</td>
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<tr>
<td></td>
<td>R&amp;D (Investigating new product characteristics)</td>
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<tr>
<td></td>
<td>Legal Branch (Checking viability and validity with regulators, level of disclosure)</td>
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</table>

The business of providing innovative financial products that offer risk management is more a sale of service rather than equipment. The technique of capturing the information-management process and bringing products to market is the knowledge base for comprehensive, full-service investment banks. These firms, which are the focus of discussion, are less likely to license the software technology developed in-house than concentrate on receiving margins from end-product manufacturing. Currently, there is an oligopoly of five American firms who dominate service worldwide, but a host of regional European and Japanese banks have positioned themselves as relatively new entrants that populate and fragment the industry.
4.2 Recent Technological Trajectory of Change

According to [Ross] "Institutional Markets, Financial Marketing, and Financial Innovation", the two largest forms of radical innovation in finance fall under the following categories:

- Creation of new derivative securities that offer risk management such as forwards and S&P futures, that perform the function of smoothing out lifetime consumption [Modigliani]

- Implementation of dynamic trading processes such as basket and program trading

Both of these forms dramatically changed the areas of money management and financial decision making away from static income generation through savings to execution of risk transfer. Thus, the range of financial innovations tends to refer to the creation of intangible end-products that allow investors to profit from directional views, index arbitrage and calendar spreads.

Prior to the era of computerization, however, financial products had no "assembly" -- and therefore no embedded technology -- to speak of. Now, there must be coordination, and therefore dependencies, between information brokerage services (which have incrementally developed to real-time, graphical user-interface applications.
such as Reuters and Bloomberg terminals), R&D divisions within securities firms, advisory service divisions within securities firms, regulators, and customers. Today, financial innovation also includes generational improvements in component information systems such as electro-mechanical devices in back-office operations (for wireless transfer and ATM withdrawal) and automatic transaction processing between matched prices on international exchanges. The Table 1 of 38 new financial products created from 1970 - 82 [Silber 1983] demonstrates the richness of financial innovation in modern history. In fact, in the decade since this empirical data was collected, characteristics from a variety of these second-generational innovations have been reconstituted in every combination possible to form third-generation innovations (such as Asian options, barrier options, quantos, swaptions, caps, floor, collars, and more). There is every reason to believe that the industry is in an active Era of Ferment.

An assumption made here is that a steady flow of incremental innovations from profit-seeking incumbent firms indicates that there are profits to be made (although what extent is from innovative products and what extent are from previous cash cows is not evident from publicly available balance sheets). From private conversations with traders and professionals in the industry, however, the source of value of new product is not necessarily contingent on being an early adapter, but in continuing to build a franchise for customers21.

4.3 Threat From Competitors

The reason is that [Gilbert and Newbery] argue that an incumbent firm would engage in massive R&D and preemptive expenditures to prevent entrants from cannibalizing their margins. In this scenario, a monopolist would preempt only if the cost is less than the profits gained by preventing entry, and we assume that a credible threat is in place. [Tufano 1989] estimates that investment banks spend $50 thousand to $5 million in legal, tax, accounting, and regulatory fees to develop a new product, excluding a $1 million payroll to sustain R&D staffing. Thus, the appearance or issuance of a stream of new products is taken as an attempt to maintain a persistence of monopoly.

Furthermore, since every public security must ultimately be registered with the SEC, the structure and payout to customers become public domain soon after issuance. Generic product characteristics are widely known, and although the dollar figure of flows is kept private, it is possible to reverse engineer almost any product by inputting a few observable variables (such as the coupon, maturity, and traded price). Thus, the threat of competition from imitators is very real, since there are no 'encryption code' mechanisms to maintain security or destroy information content once a package-seal is broken. In fact, [Schmalansee and Kemerer] found that imitators invest 50 - 75% less than innovators to create imitative products.

Therefore, the strategies that add to an incumbent's success are to crowd out competitors seeking investment dollars from financial product buyers. This can be accomplished by using speed and timing to preempt competitors and new entrants

21 Through conversations with employees of Goldman, Sachs, Morgan Stanley, JPMorgan, and a Swiss bank (Fall 1994-Spring 1995).
with products that capture sales. In the financial derivatives industry, wholesale "buyers" are institutional investors such as mutual funds, pension funds, and insurance companies who have fixed amounts of capital to allocate or "spend" across several financial instruments. Bidding for a piece of business and winning those spendable dollars can be accomplished by preempting competitors with desirable product before the buyer chooses to sink in the capital elsewhere, since the capital gets sunk in for an extended period of time.

An analogy of this preemptive bidding process for sales could be made in the consumer electronics industry, where bidding for retail dollars of gadgets depends on capturing a preset limit that the buyer chooses to spend. Once the maximum amount has been invested, the buyer holds on to the asset until it goes out of style, gets broken, or reaches its lifetime usage, in which case a reinvestment decision is made for replacement products.

Thus, retaining appropriability in the financial derivative industry involves participating in a competition between incumbents and new entrants, as well as among a handful of oligopolistic incumbents, for a payoff of potential monopoly profits. As [Gilbert and Newbery] point out, new entrants will attempt to spend R&D towards innovation in order to capture market share only if they do not perceive a credible threat among current players to spend R&D to preempt them. Thus, the benefit of R&D innovation for investment banks is the ability to maintain a persistence of monopoly profits and a tight appropriability regime because it costs less to so than to risk losing market share.

Since we know that radical innovations progress towards a cycle of incremental innovations and an Era of Ferment, with continuous value-added products for clients, then the search for successful financial R&D innovation to yield long-term profits should be predicated by the ability to appropriate rents through growth and the ability to induce widespread diffusion of these new financial products.

4.4 Diffusion of Innovative Financial Products

In the previous section, we determined the potential benefits of monopoly profits from investing in the innovation of financial products. However, we acknowledge that not all innovations are successful [Rogers]. Therefore, we would like to explain what properties about recent financial products have led to an accelerated rate of adoption. This is relevant to formulating a strategy for persistence of monopoly, because a firm could identify what characteristics relate to retention as a dominant design, and align organizational competencies consequently. In the following table, we outline how the 5 attributes of innovation apply to financial innovations, and how incorporating such features would guarantee widespread diffusion of a product. In other words, it can be argued that in designing newly innovative financial products, investment banks seeking to maintain a persistence of monopoly should consider as many of the following factors as possible in order to increase the rate of diffusion.
### FIGURE 3 - APPLICATION OF DIFFUSION THEORY TO FINANCIAL INNOVATION

<table>
<thead>
<tr>
<th>Desirable Attributes of Innovation</th>
<th>Explanation of Diffusion-Enhancing Features in Financial Derivatives</th>
</tr>
</thead>
</table>
| (1) Relative Advantage             | • Easily recognizable advantage over existing products (e.g. overcoming tax hurdles, transaction costs created by foreign exchange exposure, employing new academic theories which assign a different paradigm for stock price behavior, etc.)  
• Satisfying investor's individual risk tolerances or willingness to try something new |
| (2) Compatibility                  | • High technological interrelatedness - Creating financial products which complement each other or anticipate any technological imbalance created (e.g. instruments which hedge risks in the event of movement of interest rates or other indices in opposite directions)  
• Evidence of technological clustering - Create families of products or product lines which consist of several variations of features (e.g. products which lock in interest rate ceiling caps or floors or step function increases) |
| (3) Observeability                 | • Attain status motivation by getting buy-in and recommendations from the most widely held and critically acclaimed portfolios (Fidelity Magellan or Long Term Capital Management for example)  
• Employ network externalities in the transaction execution (Zero-sum-game contractual payments arrangements between two parties necessitate participation and increase visibility, as opposed to unilateral, single-party products)  
• Disclose information publicly through agency listing/broker devices (traders can identify when a deal is priced within minutes of announcement on Dow Jones TELERATE, preceding rapid, informal phone confirmation activity of what the underlying feature was)  
• Sanctioned coverage by *International Financing Review* and other finance press and assignment of a dedicated electronic page on any of the distributed terminal services increases dispersion of knowledge to finance practitioners that are separated from direct trading floor contact  
• Creating interesting or catchy acronyms (e.g. STEPS, PEPS, DECS, straps, straddles) makes interesting story-telling on the *Wall Street Journal* |
5. Application of Diffusion Rules in Financial Derivatives

Example of A New Hybrid Class

The following discussion traces the inception and proliferation of a particular type of equity derivative instrument. It is clear how applying the 5 attributes of innovation to a new class of equity-linked instruments called PERCS (Preferred Equity Redemption Cumulative Stocks) predicts its successful adoption, and the this analysis is important to the process handbook in order to incorporate success factors in the design of an organization that enhances them.

Unexpected Client Balance Sheet Situation Creates Opportunity

The prototype version of the PERC was created accidentally by Morgan Stanley in 1987 as a result of a lawsuit involving a client that was not able to pay a promised special dividend until a later date. A PERC is a financial innovation on a share of common stock and they are similar except for 2 things. PERCS pays an abnormally high dividend (usually 30-40%) stream over a period of 3 years, in

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22 Interview with Maria Karahalis, Morgan Stanley
exchange for a mandatory ceiling on the capital gain the instrument can have at the end of that 3 year period. Its yields provide a clear relative advantage, by surpassing ordinary corporate bonds. Additionally, the PERC issuer has the ability to limit its liability or payout if it is cash-strapped by the end of its trial period. At maturity, investors of a PERC mandatorily convert their instruments into equity at the predetermined price. Since buyers may not like the feature of a limited upside gain, they are induced to purchase the instrument by the extra returns offered by the special dividend rates up front. The issuer also benefits by being able to raise cash when markets are inhospitable, and by being able to tap into the demand of a new class of investors. A PERC has features that are technologically interrelated to bonds because of its guaranteed stream of dividend payments, but it also has features related to value of growth through equity investment.

It was not until 4 years later in 1991 that the PERCS market really took off. Morgan Stanley reintroduced them to raise cash for General Motors. Issuers of $4.7 billion-worth of PERCS outstanding tended to be companies with bruised balance sheets or unpopular shares who would not have otherwise been able to tap into capital markets. The General Motors case is an example of the observeability attribute which says that highly visible linkages to widely held issuers create status and mobilize other issuers to follow suit. Within quick succession, KMart, Texas Instruments, RJR Nabisco, and American Express began to offer PERC instruments that traded well in the after market. Thus, PERCS offered characteristics that started an era of discontinuity, followed by an era of ferment. With PERCS, the age of the custom-tailored equity came of age, and until PERCS appeared, investors looked upon structured derivatives as suspiciously exotic and speculative. However, that changed when PERCS became the first significant derivative to be listed on the New York Stock Exchange. Listing on the exchange meant that the instrument met certain standards, made PERCS easy to trade, and made them compatible with existing instruments in investors' portfolios.

5.1 Proliferation of Modified Versions and Repeat Engagements

The size of the domestic US market for convertible-type securities blossomed from $35 billion in 1984 to $125 billion at the year-end 1993, as the family of interrelated convertible stock technology flourished. The fastest growing category for financial innovation in the early 90's were the hybrid convertibles. PERCS were followed by several descendants called ACES, CHIPS, DECs, ELKS, EPICS, PRIDES, SIRENS, and YEELDS. What helped propel the volume higher was the growing attractiveness of these securities for investors of all kinds. For one thing, convertibles became more flexible as more hybrids emerged -- an example of informational increasing returns and diffusion through "learning by using". Never before had US corporations faced such a wide range of viable ways to raise capital.

Competitive Dynamics Affect Innovation-Driven Leadership

At the time the first PERC came out, Investment Dealer's Digest labelled PERCS the year's hottest product and proclaimed that Morgan Stanley would remain the leader in this product line for the foreseeable future. By 1992, Merrill Lynch, however, jumped on the bandwagon to become the first firm to structure a large
synthetic PERC with a foreign company, using the trademark EYES (Equity Yield Enhancement Securities). The instrument is exactly the same as a PERC from an investor's perspective. Morgan Stanley followed soon afterwards with a tax loophole version on a fixed basket of technology stocks and called it STEP (short-term equity participation) units. The fact that many of the high-tech stocks were among prominent losers in the American Stock Exchange, where the new instrument was to be listed, prompted scrutiny by the SEC to try to intercede.

Nevertheless, Merrill was the first issuer to repeat the PERCS-type deal with an issue for a client in March 1993, raising more than twice the amount of capital it had anticipated. By year end, Merrill stunned the market with a set of five PERCS-type deals filed within one week for different companies. Barron's reported a blockbuster year for Wall Street firms, who reaped $150 million in underwriting fees related to the new hybrids.

Soon, Salomon Brothers followed suit in July 1993 to introduced DECS (Dividend Enhanced Convertible Stocks). The deal was doubled in size after the investment bank received orders totalling nearly 4 times the $100 million originally planned. This was Salomon's first offering of its new hybrid security, but it differed slightly in features from the original PERCS because there was no absolute cap in the participation of a stock price rise. One week later, Salomon made another modification called ELKS (Equity Linked Securities), which took away the mandatory option of conversion, and introduced the idea of redemption for cash rather than stock.

By this time, the new equity derivative product could be considered a well-accepted instrument due to its highly-visible entrance, marketing and support by prestige firms, and listing in generic contract-specified exchanges. After a period of respite, the technology trajectory continued to grow in size. Only some 16 months after PERCS were first introduced, Morgan Stanley announced a $2.2 Billion offering for RJR Nabisco, even though many industry observers thought it would be highly unlikely for RJR (or any company for that matter) to issue PERCS again. In fact, bowing to realities of an increasingly gun-shy market, PERC's principal cheerleader was forced to restructure its giant offering for RJR to make it more palatable to institutional investors by giving them a new provision to bail out in case of an unfavorable merger. Unrelentlessly, Morgan launched PEPS (Participating Equity Preferred Stocks) in the private placement 144A market in March of this year.

5.2 Towards a Tight Appropriability Regime

In the previous section we saw how the competitive forces within investment banking firms led to an accelerated path toward financial innovation once a product was identified as being successful. Obviously, there were advantages for Morgan Stanley of taking the first-mover advantage, because they continued to repeat their efforts to improvise and modify the equity derivative product. However, their leadership was quickly lost among the other bulge bracket firms that quickly entered by imitating. Now, we will analyze whether it would be worthwhile for new entrants or second-tier banks to enter in the convertible hybrid market, given that the oligopolistic firms have an incentive to deter entry.
Unlike industrial manufacturing firms where patents can be granted, financial industry 'manufacturers' cannot patent their processes or products. Also, due to the highly-regulated nature of the securities industry, proprietary know-how that is developed in-house cannot be kept as a trade secret indefinitely. Ultimately, registration with the SEC leaves the details available for public consumption in prospectuses. Therefore, the financial innovator does not exist in a tight appropriability regime [Teece] where the firm has the time needed to perform trials needed to get a design right.

Instead, we observe that the two conditions for [Fudenberg/Tirole] preemption strategy are satisfied: short information lags, and payoffs that are common knowledge. Therefore, the most crucial advantage for bankers is the timing of information release, and investment in a program that continuously churns out products to maximize the probabilities for success and minimize contractual problems. The case of financial innovation is described by the high initial costs of R&D, which are minimized by delaying spending until the point right before a competitor decides to invest in R&D. The problem is that an incumbent may be so preoccupied with preempting their competitors that they adopt earlier than is optimal.

Lastly, since the core technology is easy to imitate, commercial success swings upon the terms and conditions upon the required complementary assets can be accessed. In this case, the complementary technologies from the value chain in packaging information is access to accurate, timely information, and relationship-specific distribution channels. Thus, the idea of joint-venturing with firms with well-developed distribution networks, a trained sales force, and a client base is a recommended strategy for an entering firm that already may have a vertically-integrated R&D unit.

The one mitigating factor in the lack of tight appropriability is the beneficial effects due to the diffusion of the new product. In the case of the introduction of PERCs, the reputational effect of having introduced a new hybrid product may not have prevented competitors from entering, but it does leave investors with a knowledge that Morgan Stanley would be an active market-maker in PERCs that they issued. Thus, the diffusion of a new product is non-trivial in the long-term profitability of an investment bank, because investors would know to come back to the original issuer if they wanted to transact out of their holdings of PERCs. Then, the originator could generate transaction-based fees by distributing and re-distributing the product out of client's portfolios and back into their own portfolios. This element of recycling financial products and supporting a secondary market is similar to the recycling of materials that occurs in aluminum and glass bottlers and paper manufacturing. As we shall see later, the organizational impacts of recycling products are to shift away from the paradigm of a producer/consumer dependency that primarily hinges on supply chain management for efficiency.

5.3 Methods of Maintaining Monopoly Power

[Gilbert and Newbery] suggest four means for maintaining a persistence of monopoly power in a weak appropriability regime. These can be modified and utilized to formulate a technology strategy for incumbent firms in financial innovation:
• **Preemptive patenting** - Although financial firms have no legal recourse to sue for copyright protection, the idea of patent thickets and "sleeping patents" can be covertly enforced by keeping trade secrets on in-house pricing and modeling.

• **Building comparative advantage in R&D** - Unlike [Arrow] and [Reinganum], incumbent firms need not worry about cannibalization because the new products target different investors. [Gilbert and Newbery] point out the idea that monopolistic firms may not have to engage in preemptive measures at all because new entrants may not bother to invest in R&D if they believe incumbents will. However, the Nash equilibrium is that monopolistic firms end up being the firms that spend on R&D, since they need to have a credible threat of raising prices and driving out new entrants.

• **Preemptive brand proliferation** - The fact that several catchy acronyms were used to increase the visibility and marketing of the new financial products points to the idea of gaining control over complementary distribution assets.

• **Accelerated investment in capacity expansion** - The preemptive idea of joint-venturing with a well-established distribution channel with a trained sales force and existing client base is recommended for an entering firm that may already have links with an R&D unit. This serves to crowd out dollar investment spending from going to other competitors, since speed is of utmost importance in the diffusion of an innovative financial product.

5.4 Targeted Areas for Financial Innovation Improvements

Recall our definition of the industry as relying on a high-end service bureau with delivery of complex "manufactured" products, and our assumption that the packaging of information consists of an open system of multiple, linked subsystems. The general argument is that of implying a credible threat for deterrence of new entrants. There are five areas for targeting organizational competence in the case of an incumbent firm trying to maintain the persistence of monopoly

**Recommended Areas of Investment:**

• **Transactions Processing** - Operational efficiency and the investment in a scalable, mission-critical hardware system is important in the speed of diffusion and in lowering costs of overhead for development.

• **R&D** - Rather than licensing out the embedded architectural knowledge and software applications for coordination in-house, a firm should keep R&D in-house to minimize the effects of performance measurement. The disadvantage of a contractual obligation to a university or think-tank is that third-party users may be able to have access to knowledge that generates revenues most when unknown by competitors. The attitude is that ultimately, proprietary R&D will be disclosed, but in the meanwhile,
relationships with academics should be fostered to build an in-house framework so that speed can be maximized when necessary. The idea is to delay the time to discovery by competitors for as long as possible.

- **Product Differentiation** - Prevent commoditization of services by promoting name-brand proliferation in service and reliability. This goes hand-in-hand with in-house transactions processing efficiency, because it enables the sales force to access up-to-date, accurate information for clients.

- **Product Design** - Tying in with R&D, the necessity to establish a clear relative advantage in new products enhances revenue generation. If developed hand-in-hand with complementary marketing and distribution channels, superior product design could constitute a technology-push strategy that addresses client needs for more yields and more stability.

- **Legislation** - In an effort to gear towards a tight-appropriability regime, existing firms could lobby to change rules with the SEC, or at least establish a rigorous dominant design that would discourage non-committed entrants. Also, the establishment of generalized specifications for listing on public exchanges lends to greater demand and diffusion of an innovative product. Agreeing on specifications shifts competition away from product design to pricing.


*What To Look For*

Having outlined the economics of financial innovation, and the factors leading towards monopoly profit, we can examine the supply chain management process for derivatives in investment banks. An overall assumption being made is that off-balance sheet products (which derivatives are) serve as risk-management tools for clients. The generic supply-chain model being used refers to the make/use dependency between producer and consumer. We know that successful product-cycle innovation leads to greater competitiveness, and leading-edge technology leads to profitable "repeat" transactions. Therefore, a system-wide receptiveness towards rapid change is essential for product innovation and profitability. We can now document the activities involved in financial product creation, and relate the task of new product design to the customization process that occurs in manufacturing supply chain management, before making any insights.

What this section will attempt to do is to explain, in very simple terms, what the analogies are between the supply chain management process in traditional manufacturing with the supply chain management process in financial derivative manufacturing. There are two levels of activity lists: the overall function of a global securities firm, which includes new product development, resource allocation in manufacturing, and distribution, and the particular activities that go into the most complex part of that process: product design in manufacturing that occurs in sales & trading.
It is interesting to note that we started out looking for ways to maintain monopoly profits in investment banking and found that R&D towards innovation could be a successful way to preempt new entrants. This is relevant to the product design process because the extent to which customization occurs depends on the smooth addition of new features, which depends on having a consistent pipeline to R&D. In addition, the process of rapid and frequent customization is enabled by the ability to have open modules and components that can be easily deconstructed and recombined. This lowest common denominator element in finance is the stream of cashflow payments which every derivative instrument is an obligation to pay for over an extended period of time. The terms for how a loan or fixed income obligation is paid back, of course, varies according to the client’s needs, but it is the structuring of the terms of payment that constitute the customization of the financial "product".

6.1 Overall Activity Hierarchy of Securities Firms

A securities firm can be viewed as a manufacturing facility for financial products. It must purchase raw materials to create these risk management products, transform the products through packaging of the component parts, and distribute the products to users who utilize them for risk management characteristics. There are five main activities that firms are involved with:

1. New Product Development activities, which include new product creation and innovation through R&D
2. Trading activities, which includes the packaging, creation, customization, and pricing of new derivative products
3. Distribution activities, which includes the solicitation, specification and sale of orders,
4. Aftermarket activities, which include the reselling and support of aged inventory, and
5. Risk Management services, which includes the resource allocation and control of capital reserves

Based on the detailed descriptions of the overall operating functions on the next page, it can be seen that the primary orientation of a securities firm is to provide financial services to clients, executing these services through sales and trading. This can be accomplished by either creating new product from scratch or by using pre-existing products that can be rejuvenated or refurbished slightly. New product creation is the activity of customizing product to suit a client's specific needs, and these needs can range from generic products to highly specialized products.

6.2 Explanation of New Product Design Process

The way a securities firm accomplishes product design is to have specific modules or templates of products that can be recreated repeatedly due to
<table>
<thead>
<tr>
<th>Level</th>
<th>Activity</th>
<th>Actor</th>
<th>Goal</th>
<th>Artifacts</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>New Product Development</td>
<td>New Product Innovations Committee</td>
<td>Authorize, approve, and allocate resources for new generation of financial products; Keep an open stream of products to maintain competitiveness</td>
<td>Application for convening of cross-functional committee by individual product group head and product developer</td>
<td>Profitability and competitiveness depend on swift approval of a product to mobilize resources for introduction and distribution; Convening the new product committee is a last-step formality for legal purposes and the decision is usually made within hours; Most of the product development time is really spent in the testing of market sustainability on the trading floor</td>
</tr>
<tr>
<td>1.2</td>
<td>Trading Activities</td>
<td>Treasury and Fixed Income Dept.</td>
<td>Provide financial services to institutions by creating, buying, and selling financial instruments</td>
<td>Trade entry tickets (paper) and trade entry processing system; Direct bilateral settlement agreements between credit dealers of clients and firm or through membership in banking clearinghouses</td>
<td>Execution of trades depends on recognizing the existence of trades on computer systems that monitor credits and debits to balance sheets; Proper credit depends on agreement between two sides on the transaction amount</td>
</tr>
<tr>
<td>1.3</td>
<td>Distribution Activities</td>
<td>Sales</td>
<td>Deliver specific financial products that help clients manage their balance sheets</td>
<td>Legal agreements between clients and the firm for exchange of instruments</td>
<td>Balance sheet control of clients depends on the right advice on purchasing the right financial instruments to cushion risks from the volatility of markets</td>
</tr>
<tr>
<td>1.4</td>
<td>Aftermarket activities</td>
<td>Sales</td>
<td>Maintain a brokerage of aged products in inventory for sector of clients</td>
<td>Aged inventory and specialist sales force in secondary market (akin to &quot;dealershps&quot;)</td>
<td>Aged or &quot;used&quot; products sometimes get resold by customers who no longer need the risk protection or who believe that they can get better value by reselling old product and buying a new one</td>
</tr>
<tr>
<td>1.5</td>
<td>Risk Management Services</td>
<td>Treasury and Fixed Income Dept.</td>
<td>Monitor risk across all Fixed Income trading products locally; Report internal product group balance sheet, capital reserves, and liquidity; Control actions to maintain triple-A credit rating</td>
<td>Trade entry processing system which calculates daily profit-and-loss statements; Trade reconciliation, discrepancy reporting and ad justment components embedded in P&amp;L system; Control staff sitting next to trader for verbal confirmation and closeness</td>
<td>Risk management depends on accurate knowledge of cash reserve-ratios for the entire portfolio of products, where each of the 8 major product lines have separate inventory and P&amp;L Product lines: Foreign exchange, bank notes, precious metals, debt securities, equity securities, interest rate instruments, exchange-listed commodities, and derivative products</td>
</tr>
</tbody>
</table>
standardization. Some clients that want a standard product do not need customization and have standard orders that fit standard specifications. In fact, new product development is the idea of migrating and generalizing what used to be customized products to a standardized product that fits an entire class of investors who have the same type of demand. On the other hand, some clients may have specific needs related to their beliefs in market conditions, due to internal processes such as end-of-year reporting or international accounting procedures. The process of customization is about the coordination of matching economic conditions with client needs, and the with the willingness or ability of the securities firm to provide the specific product given a limited supply of capital or risk.

One hypothesis that the activity analysis should hope to demonstrate is how well financial products lend themselves to last-minute customization, due to the intangibility and tractability of the product. In fact, the trading activity to be examined is the heart of the product design and product-mix coordination process that occurs in financial product manufacturing. It is the place where the greatest amount of coordination intensity occurs. By decomposing it into several sub-activities which may or may not occur in sequential order, we can demonstrate the flexibility and iterations of feedback that occur before proceeding to the final step of delivery to the customer.

For example, the solicitation of whether a customer's time horizon is a 5-year stream of cashflows or a 10-year stream of cashflows first needs to be determined. When this is determined, a trader might start putting together ideas for a $50 million dollar 5-year product which can be allocated and split among other 5-year product clients who desire different characteristics. The analogy here to industry could be to look at an airline company that is planning to offer routes to a particular destination, and trying to allocate what percentage of seats should go to economy, business, and first class. First, the airline must decide whether there is sufficient demand to open a route from Boston to San Francisco. All the passengers are interested in going to the same destination, but require different types of service, which have different kinds of characteristics.

Alternatively, the trader can design a 5-year product within a larger, $100 million deal that consists of 1-year through 15-year products, with the client asking for 5-year product receiving a stream of cashflows that terminates at with a maturity 5 years from now. This type of preliminary product design consideration is akin to deciding whether a direct flight from Boston to San Francisco may be substituted with one that stops in Chicago or Seattle to satisfy other travelers. This decision does not deal specifically with different types of coach service (most domestic flights tend not to have class distinctions), but does deal with whether a desired product can be combined with other similar products. It is a type of product design question because a non-stop flight is slightly different from a flight that stops for a 2-hour transit midway through. In finance, a generic 5-year product could be the purchase and sale of 5-year Treasury notes, while a coupling product could be a 5-year corporate bond offered by GM. The latter product could be part of a longer-term refinancing package sought by GM to borrow from many different investors and hope to pay them back by the year 2010 (15 years from now). In other words, GM would try to sell a package of $100 million corporate bonds to investors, and pay some of the back within 1 year, 5 years,
10 years or 15 years. The analogy to the transit flight is appropriate because the 5-year corporate bond service is slightly different from a Treasury bond -- GM could go bankrupt before 5 years is up! The likelihood of that credit risk is low, but nevertheless exists. Similarly, a San Francisco-bound traveler will ultimately end up at their destination, but there is a small chance they may miss their flight in Chicago. In finance, the product design has much to do with the credit and reliability of making a stated obligation of payment, and there would certainly be a difference in offering price between the two type of service.

After getting more feedback from several customers who may share the same profile as the original customer, the trader can gauge the demand for a new deal. In fact, if the company has a standard deal size -- say $100 million -- they may continue to wait and take orders for products until enough demand exists to satisfy the standard template to launch a transaction. In other words, the firm has the option of determining whether the product can be offered at all, according to minimum investment interest from clients. So for example, a charter airline may require a minimum of 65-70% of pre-sale of tickets before planning to go ahead with a trip. This is similar to batch-processing decisions that go on in manufacturing, with the exception that once a batch begins production in industry, there is very little chance for modification or customization. For example, a batch of chocolate chip cookies that goes in for baking must go through the entire baking process start-to-finish, and there is no way to change a portion into a chunkier style or a mini-size cookie midstream. In the airline example, it is not easy to switch the number of first-class seats with economy or business seats according to the exact number of paying customers for that class -- and still remain on schedule (an amusement park operator can wait to fill the number of seats on a ferris wheel before starting a "batch" run).

In finance, however, you CAN change the proportions of a batch (within reason) by simply repackaging the product. This type of product design relies entirely on the concept of preservation of capital -- what flows in must also flow out. In other words proportions of components can be combined to synthetically recreate the characteristics of a weighted-average product. By this I mean, there would be a roughly 50-50 split of 1-year and 10-year products to recreated a weighted-average 5-year product, and there would be another unique proportion of 2-year and 10-year products to recreate the same average. Therefore, the number of 1-year, 2-year, 5-year, and 10-year products within a batch of GM corporate bonds can vary according to demand in the process of creating them because of portfolio of different instruments can yield striking differences. Also, customization is possible until the very last-minute in order to suit almost made-to-order requests for product.

To illustrate this, suppose that $20 million dollars are allocated for 5-year product that has all been earmarked for other customers, but were still parts left in other pieces of the GM corporate bond issue. If a new client were to surface wanting 5-year product, the securities firm could combine $2.5 million of 1-year product and $2.5 million of 10-year product to get them somewhere close or near to the desired target. If the current date is May 1995 and the 5-year product would make its final payment in May 2000. Suppose the client closes its fiscal year in November and has the habit of making large dividend distributions at that time. It may then ask whether payments could be extended 6 months on the original 5-year product. This is
easily accomplished by combining or pouring in more longer-dated instruments, say 10-years, from the amount that has not already been pre-sold. If all the 10-years are gone, the securities firm could use a smaller proportion of 15-years to accomplish the same result. The infinite divisibility of money into any unit of size, and the intangibility of combining cashflows into a portfolio of future cash payments makes it easy to customize products for customers to a great level of detail.

After determining one product specification (the time horizon), the trader who does the packaging of the product could further customize by asking whether that 5-year stream of cashflows needs to protect them against a drop or rise in interest rates, and even to what degree of drop or rise in interest rates (i.e. a 2% drop or a 10% drop). In fact, a floating-rate note does just that, and the formula for leverage is another form of customization. For example, a LIBOR-based floating-rate note can move exactly with LIBOR, so that the purchaser of a swap will get an interest rate exactly matching the interest rate market movement. The upshot, of course, goes back again to the principle of conservation of capital -- there must be an investor who is willing to take an equal and opposite bet on the market. So, for example, a 5-year instrument which has an underlying cashflow of 6% interest over the life of 5 years could be split into floating-rate note with a base rate of 4% that increases over time and a floating-rate note with a base rate of 8% that decreases over time.

However, if the client is really risk-averse, they can choose to get a 1.5 times leverage and even 4 or 5 times leverage instrument. This means that for every 1% increase (or decrease) in the LIBOR rate, there would be a corresponding increase (or decrease) of interest payments of 1.5% (or whatever multiplying factor is chosen to match the customer's risk tolerance). Concurrently, there must be an equal and willing investor who is willing to purchase a 1.5 times leverage inverse-floating instrument -- and this could be the securities firm itself, or another buyer who has a different opinion of the direction of interest rates. Since the leverage factor is again intangible and infinitely divisible, the opportunities for customization are numerous and plentiful. For example, if the client has an obligation to make a minimum payment worth $7.575 million 5 years to the date, they could choose to purchase a $100 million 5-year floating rate bond of 6% with a floor of 6% and a multiplier of 1.2625% to exactly equate the interest payment due with their outside obligation. In fact, customization does not have to be limited to one type of interest rate (LIBOR). The securities firm could use interest rates in Japan or Germany, or could even tie the floating-rate note to the difference between interest rates in two countries, and factor it by some multiplier.

Now, one can begin to see the possibilities for numerous instances of customization, as long as there is a willing counterparty. Thus, financial derivatives firms offer the flexibility and ease of providing the most generic to the most customized of financial products that are practically made-to-order.

6.3 Analogy to Supply Chain Procurement

A central premise of this paper is that similarities exist between the supply chain management process in manufacturing and finance. From the Operation Process Classification Scheme of the American Productivity & Quality Center in Houston,
Texas, we see that there are three major activities in supply chain management: procurement, manufacturing, and distribution.

First of all, the analogy for the procurement of raw materials in the production of financial derivatives is the purchasing and acquisition of capital from which to create derivatives. This can occur in two forms, depending on which type of trading activity it supports: new product creation or brokering arrangements. In the former, the accumulation of capital reserves enables the bank to issue or promise a payment of cash outflows. Fixed income derivatives are nothing more than agreements to pay cash outflows on a timely basis over a period of time. The accumulation of capital reserves that serve as the basis of cash outflows can be purchased by borrowing from overnight banking markets at the Fed Funds rate, or by purchasing financial assets that someone else agrees to fund, such as credit card payments, auto auto loans, or mortgages from major commercial banks. In this case, the collective payments of several credit card holders, car owners, or homeowners are pooled together to serve as the asset collateral from which the securities firm can now issue new derivatives, based on a promised set of cash inflows. So, the purchase of a bulk set of mortgages originated by Citibank or Chase serves as a raw material for the creation of derivative instruments.

VALUE CHAIN OF INFORMATION PROCESSING

Supply Chain in Securities Firms

<table>
<thead>
<tr>
<th>Provide Financial Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make and sell risk management tools for profit</td>
</tr>
</tbody>
</table>

- Procurement
  - Purchase capital or risk
  - Accumulate capital reserves through previous profits
  - Accumulate risk from other parties by repurchasing other risk instruments

- Manufacture Product
  - Refine, process, transform information
  - Forecasting demand
  - Packaging different component parts for specific product
  - Customize products to fit client profiles
  - Verifying trades to fit regulatory standards, legal opinions

- Distribute Product
  - Sell package
  - Matching customers with orders
  - Taking and delivering orders
  - Executing trades, verifying quantity and price, shipping & receiving payments, settling cash accounts

- View investment banks as information “factories”
- View financial products as “packages” of information
- Special advantage due to absence of physical storage and transportation

The other type of purchasing that takes place is the repurchase of previously issued or existing derivative instruments which are now seasoned or aged. Since fixed
income instruments have a given life of cashflow payments, after a period of time, they become partially "consumed" or used up, so that the remaining stream of cashflows can be valued as a financial asset. For example, a 10-year foreign currency hedge agreement issued 2 years ago has a remaining asset life of 8 years of cashflows. If a securities firm buys back these derivative instruments, it is purchasing a stream of probabilistic cashflows and is "acquiring" an element or degree of risk. Since finance also follows a conservation of risk capital, the firm could choose to hold this risk within its own inventory (for its own accounts in proprietary trading) if the form of risk cancels out the risks from other positions that they have. More likely, however, the repurchase of seasoned materials is a form of raw material procurement because the securities firm can resell it as part of providing risk management services to other firms. In fact, seasoned materials may also be recombined with other repurchased parts to create a product with different characteristics that can be sold. Thus, the acquisition of previously existing derivative products is a raw material for the brokering and reselling of derivative products, and the firm can get advisory fees for brokering the arrangement or re-manufacturing the product.

6.4 Manufacturing Process Analogy

The second part of the supply chain analogy is the manufacturing -- i.e., the refinement and transformation -- of the financial product. This can be decomposed into:

1. Determining feasibility or forecasting sales, including choosing product mix
2. Packaging the product, including product design and quality control, and
3. Releasing the product, including authorization on budget use.

In the production of financial derivatives, these functions directly correspond to the trading activities. Trading & sales encompasses gathering information, analyzing products, and executing trades. Gathering information entails understanding markets and understanding customers. Analyzing products, which roughly corresponds to the manufacturing function, entails assessing product design features for compatibility with customers, which also relates to distribution functions.

For example, determining the feasibility of a new deal consists of traders looking at a constant pipeline of hypothetical deals and updating prices according to market conditions. In other words, a trader who is in the business of issuing foreign exchange currency swaps products, will take a structure of cashflow payments that has worked in the past or has been issued by a competitor recently. In recreating the same type of module or template, they can establish whether the markets are favorable or unfavorable for the issuance of such products almost instantaneously, by inputting current exchange rate prices and the spreads above the rates that customers are willing to pay to enter a risk management transaction. By looking at hypothetical transactions continuously, the trader can identify exactly when there are windows of arbitrage opportunity based on movements of currency prices above or below the theoretical fair value. Using conservative estimates for what customer mark-up spreads could be, traders can decide to pull the trigger in launching a deal offering at any moment that the analytical software indicates the product offering would make money given the quoted currency prices.
Instead of calculating the maximum expected gain from a product by forecasting the maximum customer mark-up, the product feasibility exercise can be a completely front-loaded decision of having a product in place, and then being alert for breakeven rates at which a deal would be profitable. In other words, if the dollar-yen rate goes below a pre-calculated trigger point, it would be profitable to issue a currency hedge to a representative customer. The method for market feasibility is different from traditional manufacturing because it is extremely responsive to the timing of market conditions, and demonstrates extreme readiness of a product to be manufactured and sent off the shelves within seconds. In effect, manufacturing a financial service product is triggered by nothing more than a call to the prerequisite federal agency to register a deal and make it public. Unlike clothing or toy manufacturing, where product feasibility, product design, and product manufacturing must precede store-front delivery by one buying season, financial manufacturing occurs within seconds from which it would be profitable to make a sale.

Thus, product feasibility could be viewed as a process of scouting for what range of prices a deal would be worthwhile to manufacture. In the financial derivatives new issue market, a previously successful product with given specifications can hypothetically exist and be delivered right away if the securities firm can identify a customer who is at least willing to pay the breakeven price. The advantage the intangibility of the product offers to the securities firm is to free up resources that otherwise would have to be sunk in the manufacturing of an offered product.

Another way that securities firms determine feasibility of a product depends on customer demand and how much they are willing to pay for a product. Actually, in terms of bonds, the price is more often quotes in terms of what yields or rate of return the client can get -- the higher, the better. Higher yields demanded by customers means that the securities firm has to pay out greater yield to entice customers to buy the risk management instrument. Therefore, pricing of the transaction would be incomplete without customer feedback about what kind of yields or payments are required for entering the transaction, because the level of demanded yield indicates, somehow, the cost of doing a deal. One strategy may be to accurately price financial risk management products according to the fair value of protection that they offer and make prices flexible, while another strategy may be to determine sensitive price points and try to provide products that satisfy that range of prices. An example of such a pricing strategy could be Filene's Basement retail store layout according to price range (Under $100, Under $250, Under $300)\textsuperscript{23}.

Customer price feedback partly determines the product design, because the initial offering may not even take place without a guaranteed percentage of orders. If none of the hypothetical deals or products seem to be making sense given market conditions and given customer price points, a trader should take this as automatic feedback that there is no feasibility for that particular financial service and that efforts should be made to alter or tweak product design. Since the derivative is a hypothetical product that exists only on paper as a product offering for a future set of possible income streams, there can be several iterations of product prototyping and product

\textsuperscript{23} Another example I found was certain flower shops in Grand Central Terminal in New York City that price a dozen roses at $25.99, $18.99, and $16.99 according to length of stem, remaining life, color, and general appearance of freshness.
designing to suit customers. Once again, since a financial derivative is a promise for a particular type of future cashflows, customization is almost costless. It is not unusual for product sampling and product testing to occur through 2 or 3 comparative sales memos, which would be tremendously more difficult to produce for a large aircraft, for example.

After the feasibility of a product has been determined, traders involved in product design or product mix have to check on availability of raw materials and see whether the actual product creation would be within their assigned risk capital limits. Every trading desk is monitored for the amount of capital that they put at risk by underwriting new instruments, and a quick check on the capacity utilization of this resource is part of deciding whether to greenlight production. Part of greenlighting new product creation could also be checking inventories for pre-existing derivative products that might fulfill client needs or checking for aged inventory that the firm might want to purge. Assessment of in-house inventory or portfolio of instruments could partly drive the brokering arrangement piece of business mentioned earlier. It could also influence the willingness of traders to change the proportion of product mix -- if the host site already holds several hundred million dollars worth of Eurobonds, they may decide not to issue new bonds and deliver existing bonds to clients instead, or decide to issue new derivatives on seasoned Eurobonds that they already own.

Besides deciding product mix, product designers may be concerned with quality control and standards -- such as fitting products to legal and regulatory specifications, as well as to customer specifications. Certain banks or insurance companies may have limits to the riskiness of products that they can purchase, and securities firms offering derivatives may have to perform "banking test" to assure customers that the derivatives do not change in yield by more than a certain amount if interest rates vary by more than 3% each way. This is an example of product quality control and testing.

After a financial product has been assured of fitting customer and regulatory standards, the product design has been somewhat finalized and a preliminary structure for the terms of payment is set in place. Assembly of raw materials occurs through internal decisions of whether to commit capital and launch a product. These are pre-release actions which ready the product for distribution once orders are taken and the official launching of the product takes place. After a structure has been determined, most of the effort is placed in getting pre-sales or allocations of the deal to customers. Prior to launching and releasing capital resources, as much as 65% -70% of pre-sales is often a good benchmark for a successful new issue. These pre-orders are called "soft circles", because there are "circles" placed on orders from customers who are lining up for purchases, similar to pre-theatre reservations. Distribution and execution are discussed further later.
NEW PRODUCT INNOVATION IN FINANCIAL PRODUCTS

Specialization and Decomposition of Sample Operation Process

Determine feasibility

- Analyze Data
  - Look at general trends/forecasts
  - Look out for theoretical price discrepancies and arbitrage

- Calculate Expected Gain
  - Get Breakeven price
  - Estimate cost (complexity, leverage)
  - Estimate risk/reward payoff

- Check Risk Values (VAR)
  - Look at current position
  - See effect of new position (market sensitivity)
  - Check proximity to limit

- Choose Product Mix (see next page)

Package Product

- Design Product
  - Fit to regulatory standard
  - Fit customer standard
  - Use advanced technology
  - Incorporate latest trends

- Assemble Pieces Together
  - Get risk capital inputs (budget approval)
  - Build and evaluate prototype using access to inventory

- Obtain made-to-order specification & pricing levels
  - Get feedback from clients about competitors' price
  - Modify existing structures to customize

Release Product

- Commit Capital
  - Confirm offering price
  - Enter trade transactions
  - Buy/sell securities

- Launch Product
  - Advertise new listing on news broker screens
  - Tell salespeople to contact clients with announcement

Global Coordination Process
NEW PRODUCT INNOVATION IN FINANCIAL PRODUCTS

Decomposition of Product-Mix Decision

Suggest Product Mix

Forecast Sales
- Identify demand level from existing clients and potential clients in local area
- Broadcast and receive information on local and global customer demands with other salesforce
- Identify preliminary sellers and buyers of aged inventory and local product among client list

Check inventories
- Look at system printouts for quantity of aged inventory
- Ask other salesforce for inventory levels worldwide
- Go to daily morning meetings to hear reports from traders on urgent, must-sell products

Decide Optimal Holding
- Target which long-held pieces of inventory to eliminate
- Determine percentage ratio of mass-volume vs. customized products that matches demands
- Calculate total size of newly issued securities to produce
6.5 Flow Dependencies in Sales & Trading

One advantage of looking at the decomposition of trading & sales activities is seeing the dependencies between the procurement, manufacturing, and distribution activities of production (See Appendix). As mentioned before, sales & trading encompasses gathering information, analyzing products, and executing trades. A Process Handbook representation of these activities in the following diagrams shows further decompositions and specializations to give a broader picture of possible interrelated dependencies.

There are three specific flows within trading & sales which demonstrate the producer/consumer relationships of procurement, manufacturing, and distribution:

(1) Product Design Flow - which has to do with monitoring external economic data, analyzing trends for feasibility, and ultimately customizing product features

(2) Customer Interaction Flow - which has to do with client interaction and feedback on economic conditions, desired features, pricing, and ultimately product customization, and

(3) Pricing Flow - which has to do with identifying arbitrage profit opportunities, calculating expected gains through breakeven pricing, and final renegotiation of pricing according to demand levels with clients.

The following series of diagrams show the sequential flows for each of these related flows, as well as their convergence on the customization of products before execution of trades and distribution. If anything, it demonstrates that the period of time for revision and enhancement of product design occurs rapidly and with three or more instances of opportunity for client intervention. In fact, the frequency of user intervention and the speed of coordination between product designers, sales force, and clients in the areas of product specifications, pricing, and quality control demonstrate the ability to customize products until just before finalized execution of payments. That is, the intangibility of the product allows for prepackaging and experimentation and prototyping through product sampling and testing, which allows for the flexibility of delaying finalized orders according to exact specifications. What is not inherent in the diagrams however, is the freedom of constraint of the shared resource of capital, since none of the raw materials procured to assemble the final product actually have to be sunken in to create a prototype. Hypothetical scenarios are sufficient to demonstrate a series of a future stream of probabilistic cashflows.
BREAKDOWN OF ACTIVITIES

Trading & Sales

Gather information

Understand Marketers
Monitor External Environment
- Monitor competitors
- Economic trends
- Regulatory/Political
- Technology innovation
- Social and cultural

Understand customers
- Identify trends
- Identify profit opportunity Pricing discrepancy
- Check Alignment

Assess Products
- Propose trade idea
- Check features
- Estimate risk/reward payoff
- Estimate costs Complexity
- Check Product Design Feasibility

Analyze Products
- Calculate expected gain
- Figure out breakeven price
- Approve product offering

Execute Trades
- Markup breakeven
- Renegotiate price OR add features
- Renegotiate terms

Price Products

Customize Products

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Adapted from Operation Process Classification Scheme, American Productivity & Quality Center, Houston, Texas

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Product Design Flow

Gather information
- Understand Markets
  - Monitor External Environment
  - Identify trends
    - Economic trends
    - Regulatory/Political
    - Technology innovation
    - Social and cultural

- Identify profit opportunity
  - Pricing discrepancy

- Check trend
  - Matching environment

- Match customers
  - Check demand

- Assess Products
  - Propose trade idea
  - Check features
    - Estimate risk/reward payoff
    - Estimate costs
      - Complexity
      - Figure out break-even price

- Check Alignment
- Matching customers
- Investment horizon
  - Years to Maturity
- Price Products
  - Check Product Design Feasibility
  - Calculate expected gain
  - Approve product offering
  - Markup break-even

- Price Products
  - Renegotiate price OR add features
  - Renegotiate terms
  - Confirm w/ client
    - On pricing and features
  - Product specifications

- General Class, Public/Private
- Quantity
  - Size, Reinvestment

Execute Trades

Trading & Sales

Analyze Products

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Customer Interaction Flow

Trading & Sales

Gather Information
- Understand Markets
  - Monitor External Environment
  - Economic trends
  - Regulatory/Political
  - Technology innovation
  - Social and cultural

- Understand Customer
  - Identify Trends
  - Identify Profit Opportunity
    - Pricing discrepancy
  - Check Alignment

Analyze Products
- Assess Products
  - Propose Trade Idea
  - Check Features
  - Calculate Expected Gain

- Check Product Design Feasibility
  - Estimate Risk/Reward Payoff
  - Estimate Complexity
  - Figure Out Breakeven Price
  - Markup Breakeven

Price Products
- Approve Product Offering
  - Renegotiate Price
    - OR Add Features
  - Renegotiate Terms

Execute Trades
- Customize Products
  - Confirm w/Clients
    - On Pricing and Features
  - Check with Client
    - Ask Feedback
  - Ownership of Components
    - Or Client Exchange
  - Product Specifications

Global Coordination Process

Adapted from Operation Process Classification Scheme. American Productivity & Quality Center, Houston, Texas
6.6 Distribution Process Analogy

The final portion of analogy to the supply chain process handles the distribution of financial derivative instruments. The distribution part can be decomposed into:

1. Obtaining an order, including identifying prospects for size and features,
2. Delivering the order, including confirming pricing, and
3. Receiving payment for the order.

Actually, most of the activities involved with obtaining an order are already pre-planned and happen as a matter of consequence, since pre-sales are part of product design and pricing. As mentioned previously, industry standard practice is to "soft-circle" as much as 65% - 70% of a new issue before it is even launched. Once an order is obtained, and a final agreement is reached regarding quantity and features, a trader will enter a sales ticket into the computer systems, and begin the process of delivery through "execution" of trades.

From there, back-office operations compile and aggregate daily trades by product, division, and region. The first responsibility of order-processing is to verify trade tickets with what was actually agreed upon from both parties -- traders and back-office personnel of clients. The reason it is important to "capture" the details of each trade is that the profit-and-loss statements that are used to report trader performance is dependent on getting accurate market valuations of existing positions. Therefore, any portion of new deals not sold remain in-house with the security firm, and any market fluctuations in the price of such items are realized in day-to-day profits. Errors or discrepancies are usually distinguishable because of sudden jumps in value or sudden omissions, in which case back-office personnel call traders to resolve differences. Trade resolutions are coordinated at the lowest level between traders and risk control staff, before being brought to division heads or ultimately the regional CFO. If everything goes as schedules, proceeds and ownership are transferred with the agreed counterparty, and records are kept for the release or receipt of capital on an ongoing basis until the maturity of the instrument. If not, the reporting of profits or losses diverge between what the trader believes it to be and what management understands the total capital at risk to be, and this could lead to misjudgements about resource allocation within the firm for profitable businesses.

However, a form of "dealership" aftermarket exists within the securities firm in the repurchase of already existing derivative instruments. If a client decides to optimize their risk portfolio by selling instruments that are no longer effective instruments for them, the party of first resort is the security firm that sold it to them in the first place. The activity of buy-backs from users and reselling to other users is certainly analogous to factory-owned dealerships for auto manufacturers. By standing ready to buy or sell aged inventory, the securities firm serves as a market-maker or broker of its financial products, and it gains from any advisory fees for arranging a match. To the extent that product resales necessitate a dispersion of information, global coordination may exist between different regional offices and subsidiaries through a shared IT infrastructure for communications. In addition, weekly sales force meetings and personal phone contact are other specializations for serving a brokering purpose.
NEW PRODUCT INNOVATION IN FINANCIAL PRODUCTS

Specialization and Decomposition of Distribution Process

Distribute Product
Sell, deliver, and confirm package

- Obtain Order
  - Identify Prospect
    - Obtain mailing lists
    - Contact clients
  - Inform Prospect about product
    - Advertise features/benefits
  - Determine pricing levels
    - Negotiate between salespeople/traders
  - Find order quantity
  - Get feedback about quality
    - Test product (Banking regulation test)
    - Modify product feature

- Deliver Order (Shipping)
  - Agree on sales quantity and price with salesperson
  - Enter trade tickets with front-end interface
  - Verify trade tickets for specifications in back-office
  - Transfer proceeds and ownership on an ongoing basis

- Receive Payment
  - End-of-day settlement
    - Cash transfers occur on maturity
  - Keep records
    - Until maturity, measure market changes and effects of P&L losses

Global Coordination Process

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7. Findings and Insights About Securities Firm Coordination

7.1 "Transfer" Component Virtually Eliminated

Pentland, Osborn, Wyner and Luconi\(^{24}\) point out three forms of evaluation criteria in producer/consumer dependencies which are useful in the information supply-chain paradigm being used to analyze derivative securities firms. One is the "transport" or "transfer" criteria, which implies notions that a consumer product must be moved or stored before it can be used. This is a substantial consideration in massive products, such as aircraft engines, or even in small products with several contact points, such as in retailing. However, the idea of optimizing the producer/consumer dependency in financial securities is practically moot, since the product is an intangible object that consists of moving bits of information over pre-set wires, rather than moving physical atoms to warehouse locations. Thus, the speed and breadth of transportation by financial firms could be a self-explanatory model for lessons in manufacturing firms. In fact, the execution of trades and automation of payments systems through client/server frameworks is a well-documented trend in financial back-office operations, and is not necessarily very revealing.

7.2 Manufacturing Concepts of Product-Mix Coordination

Alternatively, manufacturing lessons about last-minute product-mix coordination can and have been applied to the financial derivatives industry. Most of this activity occurs in the packaging of the financial product, where frequent monitoring of changes in external economic activity, as well as constant solicitation of pricing feedback from customers lends to fine-tuning of features. In fact, the most successful financial operations could form a "triage" of customer pre-processing by directing orders for generic "vanilla" products to a generalist sales force, and directing orders for "customized" products to a specialist sales force. The former relies on large transaction volume and turnover to stay profitable, while the latter relies on a large team of expert workers working off-the-assembly-line, to solve critical, one-of-a-kind problems for a premium. This form of organization has precedents in healthcare treatment--where outpatients with minor injuries are treated quickly, while trauma victims are treated with a team of specialized surgeons.

In any case, the "usability" criteria of producer/consumer dependencies is probably most important and applicable in product design. Pentland, et al. describe this criteria as demanding that previous inputs reach some level of performance or usefulness before it can be employed in the next step. In our case, financial information and an understanding of partnership must be agreed upon prior to delivery to the customer. In financial derivatives, product feature addition and customization can occur easily and anywhere along the production process, because the intangible nature of the product makes product specifications tractable and usable. Therefore, the manufacturing concepts of "just-in-time" and "point-of-sale" are relevant in inventory control and new product innovation. Customer feedback can affect the final product

outcome at the initiation of a new economic trend, during the formulation of a prototype product, and at the final formulation of features before launching.

7.3 Rapid and Frequent Customization

We can see that product-mix, delivery point, and product design decisions are pushed back as far as possible in the sequential process of manufacturing financial derivatives in the diagrams in Section 6.5. In fact, the final criteria of producer/consumer dependencies -- the "prerequisite" criteria that a product or service must be produced as output before the input can be made available -- is relevant here. The prerequisite criteria implies that something must occur for the next step to continue in a sequential production process, but the financial derivatives process is remarkably flexible in its acceptance of non-sequential processes. All three producer/consumer flow dependencies of product design, customer interaction, and pricing mentioned converge to the coordination issue of customizing products before executing trades (see last diagram of Section 6.5). The parallel processing of sub-activities and multiple entry of processes within the overall production activity characterize a free-wheeling process which often strays from sequential paths.

Thus, the trading floor of a derivatives security house involved in rapid and frequent customization, operates under an open-market outcry system that relies on proximity of the workers to facilitate a transaction. For example, a customized product could be driven by a single client with specific requests that tie in with the external conditions and pricing of a particular type of security in another country. In this case, client feedback, pricing offerings, and matching external conditions occur concurrently with assessing feasibility of a match with other investor needs for the same project. This demonstrates the simultaneity of trading & sales with new product development (since they are looking for the possibility of a fit with other clients) and risk management (by definition, since any trading decision affects the firm's usage of capital). It also demonstrates the complexity or freedom of coordination that comes with non-sequentiality.

7.4 Non-Sequential Nature of Production

In order to further demonstrate the non-sequential nature of derivative production, it is possible to show some alternative paths to product delivery which may skip certain steps and jump directly to customization of the product or alter the chronological sequence of the producer/consumer flow dependency in some way or other. That is to say, the general supply-chain management flow proceeds from the manufacture to the use of the product, but the exact sequence of product feasibility and design is of highlighted interest. For instance, in Section 6.4 which explained the manufacturing process analogy, two extreme examples were given where the manufacturing process could either be entirely front-loaded or primarily back-loaded. The difference between the two extremes is the amount of time and resources allocated towards customization of a deal. The front-loaded deal is a "deal waiting to happen", with one product design fully specified, and traders looking for the window of opportunity when macroeconomic conditions would be right to price a profitable product. There is full readiness of the product for delivery similar to a batch of chocolate-chip cookies waiting to be snapped up by customers.
Distinction of Resource Allocation Between Plain Vanilla and Custom-Designed Financial Products

MAKE

"Front-loaded" Plain Vanilla = Batch Process

Product Feasibility (Long-run vision/strategy)

USE

Simple Product Design

time

VS.

"Back-loaded" Customized = Made-to-order

Product Feasibility

Multiple Product Design Iteration

time

The back-loaded deal is the “deal looking for customers” where product mix decisions are made as you go along, almost in made-to-order fashion. There is semi-readiness of product delivery, and a lot of effort is put into product design iteration to match individual customer requests. An equivalent, but not exact, baking analogy would be the preparation of special-occasion cookie baskets aimed at 100% consumption -- where each of the cookies in the basket may be pre-ordered and assigned to a specific consumer. The final batch may contain a good deal of basic chocolate-chip cookies that would be ready-to-go, but also an assortment of other different cookie flavors, shapes, sizes, and topping features that may be customized to exact specifications for each individual. Therefore, there is a blend of batch processing and made-to-order design, because the entire product is not driven by a single, customized order for one customer, but of satisfying customized orders for several customers within a single batch.

This latter distinction is relevant to financial derivatives production because it can be noted that an entirely made-to-order product would not need multiple product design iteration. The securities firm would merely fulfill the design specifications requested, and this type of order does occur to a certain extent in the over-the-counter (OTC) or private placement market. That is, the sequential decomposition of financial
derivative production stipulates a three-step transfer of risk capital ingredients from product feasibility to product design and packaging before trade execution, but it is entirely possible to skip product design with a direct, customized order that tells exactly what needs to be traded.

On the other hand, the drive for satisfying the high-margin, special requests is such that the area for process intervention or interruption occurs mostly in customization. In the name of maximum efficient utilization of product inputs, securities firms launch batches of new deals to satisfy standard demand for standard product, and one-of-a-kind demand for similar, but slightly enhanced, product. At a lower level of abstraction than the make-use activity hierarchy, the frequency of product design iteration refers to the number of times that customer feedback to determine product feasibility is solicited after product design. At the very least, derivative production design is not final and does not necessarily go straight into trade execution as the manufacturing supply-chain flow dependency would have you believe. Rather, the iteration process asks the chicken-and-egg question of which comes first: product design or product feasibility? The fact that last-minute orders for customization get fulfilled is evidence that lengthy product feasibility activities for the next generation of innovative products is unnecessary and may not be a prerequisite in a sequential production process. In fact, successful, high-revenue products rely on non-sequential process intervention at a lower level of analysis.

7.5 Biggest Resource Allocation Problem

Since "usability", "prerequisite", and "transport" criteria can be easily bypassed or hurdled in the delivery of financial derivatives as mentioned in the previous section, the source of the severe resource allocations does not stem from the connections between inputs and outputs that are part of resolving a producer/consumer dependency. Finished product ideas are not a prerequisite for usability in the next step of product design because of the intangible and manageable nature of reengineering risk capital. Rather, the biggest resource allocation problem comes from managing the shared resource of capital, managerial attention, and capacity or "bandwidth" in the underlying IT infrastructure.

The constraint of a shared resource dependency is that multiple activities use the same limited resources, with the effect that "first-come/first-served" coordination leads to rationing of these resources. Therefore, budgets and priority attention given to pricing, distribution, product design, client interaction, and market-monitoring have to be decided such that the quality of one is not sacrificed at the expense of another. Smooth operations depend on successfully being able to handle huge upsurges in volume at one time without straining the system, while maintaining a minimum level activity so that resources are not underutilized or wasted.

7.6 Managing Resource Allocation of Risk Capital Inputs

So far, we have seen a range of products from standardized, plain-vanilla types to highly sophisticated, one-of-a-kind iterations in finance. Regardless of the product-mix deliberations between vanilla or customized products, risk capital will be needed as an ingredient to back the firm up. Thus, the shared dependency constraint
necessitates a methodology on how to manage resource allocation of inputs across the range of products. How much risk capital should go towards supporting foreign exchange derivative business versus short-term, money-market futures & options? Each has its own proportion or recipe for using risk capital. In a food processing plant that uses tomatoes as raw ingredients for tomato paste, canned tomatoes, and salsa seasoning, management has to solve a linear optimization problem of how many tomatoes should be allocated to each business product. Similarly, the amount of capital being risked can differ depending on the leverage undertaken by traders on the firm's behalf. Increasing the average level of profit based on an optimal vector allocation of risk capital $R = (r_1, r_2, r_3, ..., r_n)$ for $n$ products is a continuous, system-wide endeavour.

One form of evaluation to prioritize raw material usage would be to look at a well-defined risk/reward measure to -- in essence -- rank businesses for effectiveness and efficiency in the use of capital. As in manufacturing firms, securities firms are preoccupied with not letting any raw material costs go to waste, and the appropriate allocation of risk capital is important because a smaller amount of capital can be utilized to support a financial product with just as much as a rate of return on investment, if not higher. The smaller amount of capital “sunken in” to support a more profitable product would free up the remaining capital that would have been used otherwise, to invest in another area of risk management products. The implication of maximizing risk capital usage across a range of products conjures up the same image as maximizing firm-wide efficiency of this limited resource. The different geographic locations and different product divisions of the firm provide a network or system of areas to invest risk capital in, and the next section will contend with how best to continuously monitor where capital would be better off being invested.

In summary, risk capital is a raw material which must be allocated appropriately across a wide variety of products. Maximizing utilization of risk capital across product groups and geographic areas is analogous to maximizing network efficiency because it frees up capital to be used for the most profitable opportunities.

8. Organizational Implications

There were two major insights about global risk management and the delivery of financial derivative products from the previous section. One is that financial products benefit from having streams of cashflows which are intangible and infinitely divisible as component parts. This in turn leads to active customization due to flexibility in meeting usability, requirement, and transfer criteria. Money can be easily molded, shaped, and delivered without much cost at all! The absence of bottlenecks in the sequential flow dependency of manufacturing shifts focus on the shared dependency constraint of optimizing the limited capital resource. Thus, the second major insight is that securities firms that maximize utilization of risk capital across geographic areas and product divisions are actually trying to maximize internal network efficiency in providing service for external clients.
The following are observations on hypothetical future scenarios for the financial derivative new product development and progress:

8.1 Effects of Intangibility and Divisibility of Component Parts

Migration from Batch Processing to Made-to-Order

A decomposition and specialization of the risk management process reveals interesting ways to overcome the shortcomings of product-mix choice, resource allocation, and customization in traditional supply-chain management processes. First, since derivative production consists of electronic settlement of cash accounts, the dependence on warehousing and physical transport is eliminated, allowing first-order effects of automation in shipping and payment. Second, value creation, and the ability to maintain monopoly rents, depends on new product innovation that captures individual customer profiles. In the absence of patent protection, this industry-specific, product design process has taken the form of rapid and frequent last-minute customization, which is made possible through coordination-intensive organizations.

An important contribution of financial innovation, therefore, is the ability to transform high-volume, batch processing jobs of a few products into a high-volume, made-to-order jobs of many different products.

If we look at the above figure which shows a trade-off matrix between product-feature complexity and volume of transaction, we can detect a trend of organizational progression. With plenty of vanillas in demand, a lot of securities firms characterized sales & trading activities with a batch-processing operation -- that is, most of the
resources were aimed at product feasibility rather than product design. Batch processing is the process of mass producing one product at a time, and choosing which type of batch to do next. Thus, determining product feasibility was important, because an entire batch would be created whenever a new issue of derivative securities would be launched. As profit-seeking firms aimed to create new generations of financial derivative products, the operation process shifted to a made-to-order operation to service premium, single-client transactions with a lot of complexity in the product features.

A consequence of the intangibility and divisibility of money is the ability to rapidly customize products so that securities firms providing risk management would be able to move to a highly-customized, high transaction environment in the upper right-hand quadrant. This environment would necessitate a lot of coordination between manufacturers and clients, and there might have to be an intelligent searching agent to match up two parties to strike a transaction.

8.2 Maximizing Limited Resource Utilization

As mentioned in Section 7.6, the allocation of risk capital is similar to allocating a limited raw material resource. In one sense, maximizing limited resource utilization of risk capital is similar to maximizing network efficiency. In another sense, it could be viewed as the management of a virtual “budget” of risk capital, which has to be apportioned out to relevant divisions. This latter notion will be considered in Section 8.4.

The problem of shared resource dependency may be viewed in terms of determining what the best use of risk capital is, on a continuous basis, to increase profits. If we think of risk capital as a limited resource with a given width of a pipeline, and several different product groups and geographic areas as parties jockeying and positioning to compete for attention or space in the risk capital “highway”, then we can look to analogies in telecommunications transmission methodologies to seek some answers in network efficiency. The following diagram illustrates the effect of dedicated vs. shared methods for coordinating shared resources, given the same amount of requests. As mentioned before, in the case of securities firms, risk management depends on the proper allocation of capital as margin or security on trading bets.

The reason for this is that in order to take a leveraged bet using options and futures, a firm must put up capital at a listed exchange or with a counterparty to ensure credibility. If the transactions goes as planned, the capital does not get used up and is thrown back into the pot of reserves, after having remained idle. On the other hand, if the transaction does not go as planned, margins are collected and more money may even have to be put up to pay for losses to maintain a position. This is why
management of risk capital is so important for the liquidity of a financial firm, and why it is so important to develop a risk/reward measurement tool which guarantees that the most lucrative opportunities relative to the same amount of risk are pursued.

**SHARED RESOURCE CONSTRAINT:**
**AVAILABILITY OF RISK CAPITAL**

![Circuit Switching Diagram]

- A = Demand for Risk
- B = Capital from
- C = Different Products

![Packet Switching Diagram]

Maximize Capital Reserve Capacity

- Time

Adapted from Wessels, Arnold & Henderson
“The Big Switch II”, September 28, 1994

In wired transmission devices, different types of information such as voice, video, and data get delivered with a particular bandwidth capacity. Similarly, different financial products could require different levels of risk capital depending on market fluctuations. There are two major ways of looking at how transmission requests get routed over a wire. There is either "circuit switching"\(^{25}\), which eliminates network delays by ensuring that a device will always have dedicated access to the pipe, or

"packet switching", which allows transmission from either device on an “as needed” basis. Similarly, access to risk capital by product groups can be dedicated and assigned a starting and maximum value. Alternatively, each of the individual projects may not be assigned a starting or maximum value, but rather be given free reign to borrow risk capital as needed for however much is needed.

The source of network inefficiencies in the dedicated line of risk capital model would occur if the individual groups do not make full use of the risk capital assigned and keep a portion that could otherwise be used elsewhere idle. In the event that any of the constituents cannot make payments to fulfill their margin requirement obligations, the others are penalized to the extent that the entire firm’s credit rating may get lowered (which increases the cost of borrowing capital in international markets). Of course, the delinquent product cannot proceed in business without a line of credit that allows buying and selling activity in its account, and traders in charge of managing its position may be forced to request additional funding.

In fact, the need for fluctuating risk capital can be resolved by trading in unused portions of risk capital from underutilized divisions to those portions of the firm that are undergoing excess demand. This is the principle behind the “as needed” model, whose advantages over the former include having full access to the firm’s entire risk capital capacity if necessary. The difference with the “as needed” model and the modified “dedicated” model is that the amount of capital risk utilized is exactly what is requested, so there is no idle or unused portion of the raw material locked in a dedicated channel line. The modified “dedicated” model allows for trading in between over- and under-utilized parties.

8.3 Control as a Management Tool

The choices of maximizing network efficiency allude to issues of managerial control in deciding how to appropriately apportion risk capital to different deserving groups. One the one hand, the task of management at a securities firm could be to delegate and dedicate proportionate amounts of risk capital by setting risk guidelines, above which traders should not stray. Alternatively, top executives could choose to be less structured and see what the internal market demand for risk capital is and then make recommendations on limitations of use afterwards. A blend of the two philosophies could be to assign strict risk limits, but allow internal markets (See Section 8.4).

The implementation of a universal risk measurement value to compare differing financial products on the basis of risk and reward is the goal of risk management control. In my discussions with the host site, it came up in numerous occasions that traders had an inherent, instinctive understanding of the markets and that they made their own predictions on the impact of their trades to the balance sheet. But the implementation of a value-at-risk (VAR) system which uses a single, consistent methodology for calculating risk-reward ratios across products was intended to quantify that “feeling”26, as well as distribute information to global group executives,

26 Interview with CFO and Head of Risk control at the host site
business unit managers, and the traders themselves whose actions were being aggregated and reported.

Thus, there was an element and initiative towards transparency and information distribution similar to T.J.Rodger's idea of no-excuses management where everybody knows everything about where everyone else stands, such that nobody can hide behind excuses, and therefore productivity and efficiency are enhanced. An organizational implication, therefore, of maximizing network efficiency by distributing risk capital is to implement a measurement system that not only collects and reports traders' daily profit-and-loss statements, but also distributes the same information in aggregate form. One consequence of maximizing limited resource utilization from the previous section is to increase the amount of data and transparency of the company, in order to make appropriate decisions of resource allocation.

8.4 Market Bidding for Limited Resource

One way to maximize efficiency is centralize; another is decentralize. From Section 8.2 and 8.3, it can be seen that an internal market for bidding for risk credit limits across divisions could develop. This is possible in theory since the strict allocation and segregation of the shared resource -- the firm's capital -- would aggregate to a sum anyway. In this scenario, electronic markets could be a method for managing the shared resource dependency on limited capital. In other words, fixed income and equity divisions would be allocated risk credit limits, which would then be allocated across their respective product groups, and perhaps among respective product sub-groups (e.g. dollar-denominated swaps vs. non-dollar-denominated swaps). Managers within the product groups could be free to allocate within product sub-groups, or, in the case of underutilization could offer out the remaining credit limits to other divisions within the firm. Alternatively, a product group that is approaching its risk limit could curb the size, quantity, and riskiness of trades, or "bid" for another division's "excess" risk credits in order to subsidize continued activity.

The idea that decentralized, electronic markets can arise could certainly be entertained as a global coordination mechanism, but would be an extreme option to the idea of the centralized, managed control allocation of risk limits. In the latter case, governance and risk limits are influenced by decisions made at the top of the firm's hierarchy, based on benevolent judgements of the promising future of a business. In fact, one insight would be that the VAR would continue to be valued on two different levels:

1) from a strictly managerial point of view, in the long-term evaluation and comparison of a portfolio of businesses ranked by risk-return performance

28 Interview with head of fixed income research at the host site
29 Ibid.
(e.g. High-volume derivative businesses that are profitable but put an unacceptable level of capital at risk for the firm can be contrasted vs. high-volume businesses that yield lower returns but do not involve the same level of risk)

(2) from a practical user's point of view, in the short-term evaluation and decision analysis framework of making day-to-day trading investments, inventory control, and portfolio management

8.5 How Information Transparency Affects New Product Development

In responses to a New Product Development Survey that was distributed at the host site, there seemed to be a receptiveness and awareness of the implications of a new value-at-risk (VAR) measure. The major benefits of a standardized, global IT application would be the clarification of risk limits. Currently, the traders know what their risk valuations are, but believe that knowing the risk values on a global basis would push transactions focus to high risk/return trades across products. It was felt that knowing individual risk limits would ultimately help clients in numerous ways (relationships with clients was ranked as being very important to capturing competitiveness within the industry):

- Increasing response time to pricing questions from clients
- Coming up with new alternative products that fit clients' requests
- Assisting in the computation of risk limits in consistent terms when working with other departments
- Facilitating cross-product communication within the securities firm to increase teamwork

Along these lines, a sample computer screen was constructed to show the geographic and product risk measures for individual vs. total risk values. The graphics would demonstrate a global picture of capacity utilization of the limited capital resource, and could aid in the identification of partnership agreements between divisions to better coordinate resource allocation of risk capital. As mentioned before in the dependency analysis, the shared resource constraint was a major bottleneck to the smooth coordination of new product creation and pricing, and a global VAR system could serve as an "intelligent agent" search device for partnering internally.
One outcome or manifestation of changes to the operation globally due to first- and second-order effects of information technology would be a form of decentralized hierarchy with rotating authority. For example, in the fixed income swaps applications group, functional responsibility for legal work, quality control, technical development, and systems monitoring could be spread out over the 4 major trading centers. The head of global fixed income derivative applications support spoke of a "virtual" balance sheet which inherited pieces of other business in the 4 geographic regions. In other words, fixed income derivative applications grew as independent systems that were connected together at the end nodes, but did not exist as a single entity or balance sheet line item because the budget and maintenance fell under various departments such as information technology, trader support, and managerial support. Even after unifying the shared resource of IT infrastructure behind a single, product and profit-driven agenda, the global applications development is being envisioned to run with rotating authority where the resident functional expert will give directives to their counterparts in the other three locations.

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30 Interview with head of global technology applications in fixed income derivatives
8.6 Towards Network Exchange Systems

Information transparency would be the key driver to new product development by migrating the financial derivatives market from high-volume, low-complexity products to high-volume, high-complexity products through customization. This thought was developed in Section 8.1. Ultimately, the acceleration and volume of financial derivative customization in the 21st century may depend on the ability of securities firms to migrate to organizations with:

(1) a high level of divisibility and compatibility of component parts, and
(2) efficient utilization and availability of risk capital inputs,
(3) information transparency of customer demands.

In fact, the creation of a cohesive and decentralized unit would minimize the strain on already constrained resources\textsuperscript{31} to handle transitions from supporting vanilla trades to exotic trades. For example, one coordination issue that seemed to be undermanaged at the host site was the rollout of new software applications to support

\textsuperscript{31} An area for greater coordination revolved around balancing the training of new staff under the unified system while implementing the global system at the same time as supporting ongoing trades.
traders. Since profits and high margin trades are the biggest incentives for new product development, traders sometimes precede stable, new, computing environments by creating products that cannot be properly captured in the computer systems in terms of settlement and marking-to-market. Thus, manual resources have to be assigned and dedicated to tracking of the valuation of such a trade for the life of the instrument. This is an extremely time-consuming process that cannot be automated until the computer system is made to be as receptive and flexible to new features as the human mind -- which may be accomplished by trying to standardize features with powerful, open-ended connections to accommodate new forms.

The alternative to the "managed" view on risk control presented in Section 8.3 would be the acknowledgement that the task of monitoring internal transactions between divisions for risk credit limits would become increasingly unwieldy. Instead of tracking every two-party or multi-party connection for sharing risk limits across the firm with an organizational central office switch, the network could migrate into self-management. That is, since the argument can be made that the goal of the system (or organization) is maximum capacity utilization of the shared capital resource, managing network efficiency may be a better off with less control. Thus, global risk management coordination could evolve into the network exchange system symbolized by VISA International's framework of independent, decentralized entities. In this case, the most important issue for network coordination and management was the legal governance and standard-setting for the brand name of VISA, since the organization itself does not lend credit to customers, banks that are authorized to franchise the VISA name do.

Thus, if the financial derivatives industry is able to attain some form of self-management or self-monitoring, it could challenge Malone's assertion that high specificity and complexity of product description tend to lend itself to hierarchical organizations. Financial derivatives need a great level of customization and are highly complex products, but the breakdown of its creation process into standardized levels of granularity, with matching or complementing features has allowed the organization to migrate towards electronic markets.

9. Conclusions

In an era of dynamic changes in technological breakthroughs, a recommended strategy for an incumbent financial services firm in maintaining leadership is to invest in preemptive deterrent measures. In the financial services industry, where appropriability is weakened by easy imitation of core technology, short information lags and common knowledge of general principles, one successful way to maintain a persistence of monopoly power is to control complementary assets. These complementary assets include heavy investment in internal R&D vehicles which guarantee speed of diffusion. It also means considering joint-venturing with sales and distribution channels, and enabling sales personnel to access client information quickly and efficiently. Since financial risk management consists of a value-chain of packaging

32 Emily Breuer and Tor Jacob Ramsoy, Presentation to Organizational Lab Class, May 1, 1995
information, competence in an interlocking sub-system of information management could also influence the persistence of monopoly profits.

What motivates investment banks to innovate on financial products cannot stem primarily from the idea of capturing monopoly profits or from creating a differentiated service that sustains a higher price. This is because the industry is so highly regulated with government disclosure of specific product design, and with information so widely dispersed, that competing manufacturers can often free-ride by imitating. It was found that innovators charge lower prices than imitators in order to capture larger, valuable market shares and revenues than their rivals. Apparently, financial derivative innovation leads to a set up of secondary trades and is correlated to knowledge of relationships that make it a dominant market-maker of the new instrument. Active market-making in turn provides the bank with valuable information about the identities and preferences of investors, reducing the search costs for subsequent underwriting. Thus, the link between observed market share in underwriting and unobserved market share in trading is strong.

Decomposing the activities of running a securities firms reveals an already coordination-intensive flow from determining product feasibility to product design and finally trade execution or delivery. If anything, it demonstrates that the period of time for revision and enhancement of product design occurs rapidly and with three or more instances of opportunity for client intervention or feedback. In fact, the frequency of user intervention and the speed of coordination between product designers, sales force, and clients in the areas of product feature specifications, and pricing demonstrate the ability to customize products until just before finalized execution of payments. That is, the intangibility of the product allows for prepackaging and experimentation and prototyping through product sampling and testing, which allows for the flexibility of delaying finalized orders according to exact specifications.

The complexity of global risk management stems from the intangible nature of the product, which allowed product feature addition and customization almost anywhere along the manufacturing process, with multiple entries, simultaneous entries, and non-sequential entries. To a certain extent, manufacturing concepts of product design have been pushed as far back along the sequential process of delivery as possible, to customize products to individualized customer needs. In summary, product design in financial derivatives is heavily influenced by customer needs, although products are not necessarily made-to-order. Rather, products tend to be made in batches where last-minute customization is allowed due to the intangible and divisible nature of a future stream of cashflows. Product prototyping, sampling, and testing occurs frequently since it is nearly costless to examine hypothetical features of a probabilistic set of risk outcomes. Success of distribution is somewhat guaranteed, since customer input in product design and pricing are instrumental in even launching a product, and a minimum pre-sale level are customary.

Over time, financial derivative production has followed a migration of batch process operation to made-to-order operation, largely due to technological improvements. What used to be mass production of simple products drifted towards high-margin, customized product for single clients. Now, the trend is aiming towards
high-volume, high-complexity products, and new product development will depend greatly on searching and matching client needs. In doing so, the maximum capacity utilization of shared capital resources will be an important force for network efficiency. Assignment of risk limits can take place with a centralized allocation system that depends on collecting accurate data, or on a decentralized bidding system across divisions, which depends on an internal market for the shared resource of capital. In any case, network efficiency can be achieved through coordination of the shared resource dependency on capital, which is already possible due to the high level of granularity, divisibility, and tractability of money.

The organizational implications of managing shared resources point towards electronic markets through technology that goes beyond the first-order effects of automation. Instead, intelligent agents which aid in the system search for matching divisions with underutilized risk credits could provide a new means for coordinating shared resources. Further research may need to be conducted about the game-theoretic implications of numerous, instantaneous inputs into the system, and the queuing problems that may arise from such a Federalist system of transparency.
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APPENDIX
# Activity List of Securities Firms in Financial Derivative Products

**Structured Thesis Project on Coordination Processes, Spring 1995, MIT**

## 1.2 Trading Activities

### 1.2.1 Information Gathering

- **Goal**: Assess market conditions to determine product mix and inventory control (i.e. "buy/sell" decisions on inventory of financial instruments)
- **Artifacts**: Concentrated, information-cluttered desks with 12 - 15 screens per person and phone turrets with 30-45 extensions per desk; 1 fax machine per 8-10 professionals; laser printer per 15-20 people
- **Context**: Profitable decisions depend on formulating trade ideas that accurately anticipate market directions for clients or for internal investments. Distributing information to clients who may not data feed subscriptions aids their buy/sell decisions.

#### 1.2.1.1 Gathering Continuous News

- **Goal**: Understand external market conditions to monitor changes that affect customers as well as internal portfolio
- **Artifacts**: Computer screens with formulated views of relevant data feeds from external sources; Bloomberg terminals (real-time feed screens of scrolling news); Telerate/Reuters monitors (market bid/ask quotes to show number of offers at each price level and range of prices being considered)
- **Context**: Profitable decisions depend on getting consistent, daily, accurate, timely (up-to-the-minute) and relevant data. Level of price fluctuations (standard deviation of movement) is defined as volatility, therefore affecting valuation of risk management instruments.

#### 1.2.1.2 Gathering Discrete News

- **Goal**: Quickly react for loss prevention in case of negative disasters; Confirm or disperse expectations on economic trends
- **Artifacts**: Internal research reports showing predictions on macroeconomic directions; TV monitors set on CNBC (dedicated finance channel); Daily sales call meetings to confirm raw data and ask geographic or product experts
- **Context**: Profitable decisions depend on getting consistent, daily, accurate, timely (up-to-the-minute) and relevant data. Sensitivity of risk management instruments to price shocks can be verified and ability to cushion against shocks also tested.

#### 1.2.1.3 Analyzing News Trends

- **Goal**: Anticipate new product trends; Determine progress of a trend (upswing or downswing); confirm industry opinion on status of a trend (probability of success)
- **Artifacts**: Subscriptions to Wall Street Journal and trade magazines; Internal marketing reports anticipating customer trends and suggesting product ideas
- **Context**: Lead-time to market, preemptive product introduction and repeat product transactions (which lead to competitive advantages) depend on lead-time to trend identification, as well as lead-time to product launching (i.e. competitive advantage depends on coming up with product ideas BEFORE others)
<table>
<thead>
<tr>
<th>Level</th>
<th>Activity</th>
<th>Actor</th>
<th>Goal</th>
<th>Artifacts</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.2</td>
<td>Doing product analysis</td>
<td>Traders/Salespeople</td>
<td>Determine product feasibility, likelihood of success through massive communication</td>
<td>Daily communication with clients; Daily contact within peers of product salesforce; Daily sales call meetings with division heads to issue commands; Overnight print outs of risk positions, product inventory, and P&amp;L reports</td>
<td>Proactive consideration of new and all product ideas (including sales and trade ideas) that lead to profits depends on close monitoring of actual business situation; Decision analysis depends on accurate estimation of clients' needs</td>
</tr>
<tr>
<td>1.2.2.1</td>
<td>Checking which short list of product features aligns with news trends and clients</td>
<td>Traders/Salespeople</td>
<td>Match products with features that fit investment scenarios; Understand customer behavior and forecast corresponding demand levels</td>
<td>Daily communication with clients; Verbal feedback from clients to other sales staff; Written communication to other interested parties internally (i.e. other product salesforce and geographic regions)</td>
<td>May occur instantaneously after trend analysis during information-gathering phase; Rapid product alignment leads to better client service, and therefore, better competitiveness and profitability; Continuous relationships depend on repeat transactions</td>
</tr>
<tr>
<td>1.2.2.2</td>
<td>Identify pricing discrepancies from theoretical expectations</td>
<td>Traders</td>
<td>Determine systematic profit opportunities</td>
<td>Highly visible cross-functional team with direct authority from HQ created to implement and quantify business decision-making through value at risk (VAR) risk/return trade-off measures</td>
<td>Knowing risk measures helps identify higher risk/reward trades for traders; Aggregating valuation and sensitivity analysis leads to better control of firm-wide risks and maintenance of capital reserves, liquidity, and credit-standing (i.e. referring to efficient resource allocation of limited capital)</td>
</tr>
<tr>
<td>1.2.2.3</td>
<td>Determining product feasibility</td>
<td>Division heads, Head traders</td>
<td>Decide whether to offer a product or not</td>
<td>Overnight print outs of product inventory; Daily contact within peers of product salesforce; Daily sales call meetings with division heads</td>
<td>Usability depends on feasibility of trade ideas (i.e. whether the firm has access or ownership of the component parts) and popularity of trade ideas (i.e. whether sales staff agree)</td>
</tr>
<tr>
<td>1.2.2.4</td>
<td>Proposing trade idea</td>
<td>Tradees/Salesperson/Researchers/Structurers</td>
<td>Author timely, specific product idea which satisfies customers and internal risk management guidelines</td>
<td>Offering memo with preliminary descriptions of product specifications</td>
<td>Successful trade idea depends on checking alignment of the idea with existing data for basic soundness, and passing quality control checks for product design feasibility, legality, expected payoffs and breakeven pricing before approval</td>
</tr>
<tr>
<td>1.2.2.5</td>
<td>Pricing Products</td>
<td>Traders</td>
<td>Announce general pricing level to spark interest and get &quot;soft circles&quot; (soft orders)</td>
<td>Offering memo with initial quoted prices; Negotiations from salespeople indicating interest from clients</td>
<td>Accurate pricing strategy depends on proper fundamental valuation of the security; price discrimination among clients to charge the full price tolerance level maximizes profits, but needs to be chosen with sensitivity about relationship</td>
</tr>
<tr>
<td>1.2.2.6</td>
<td>Customizing products</td>
<td>Traders/Salespeople</td>
<td>Create a product that closely replicates what customer wants as much as possible</td>
<td>Flexibility to change features of products last minute</td>
<td>Negotiations over price and features depend on agreement over maturity, coupon, credit quality, and risk valuation, as well as sensitivity analysis; Tradeoff exists between price, quality, and protection</td>
</tr>
<tr>
<td>1.2.3</td>
<td>Executing Trades</td>
<td>Traders and operations support</td>
<td>Accurately enter keystrokes for trades into front-end computer system</td>
<td>Traders continue to transact while trading assistants enter buy and sell orders on trade tickets</td>
<td>Simultaneous processing of multiple orders depends on specialist writing down trades and confirming verbally with traders on an on-going basis throughout the day</td>
</tr>
</tbody>
</table>