Reengineering Strategies and Tactics

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Know Your Company's and Your Competitors' Strategies and Tactics Using Public Information

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Using Public Information

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Foreword

1 Origins

This book was many decades in the making. It is a natural outgrowth of my consulting and work in the US, Malaysia, Singapore and the Philippines where I reengineered a number of US, European and Asian companies. Some of these companies were multibillion dollar businesses. In the course of that work I found that many accepted reengineering methods were inadequate. Success seemed to depend strongly on the caliber and experience of the consultants involved. This suggested intrinsic weaknesses or limitations in the methods themselves.

2 Objectives

My objective in writing this book, therefore, was to help improve the methods used in the reengineering of companies. I wanted to document and share many of the concepts and tools I had developed for investigating businesses and for proposing and implementing designs for reengineering businesses. Having worked for and had contact with multinational and international companies, including Texas Instruments, Unilever, Colgate-Palmolive, Kimberly Clark, and Coopers & Lybrand Management Consultants, I know that many of these concepts and tools for business reengineering are not currently used in the manner discussed in this book.

3 Background

My research into how and why factories work started in the late 1980s at Texas Instruments (TI). Pitted against two extremely competent teams, I began to consolidate and re-evaluate this research. I developed TI's next generation of planning systems, Daily Factory Starts (DFS), for its Assembly/Test sites. The DFS development was one of the top ranked projects for TI in 1991.

I select specific thought provoking problems found in multinational businesses. As these are first hand observations, I am able to iterate, through the issues at stake, until the manufacturing problem is clearly defined in a generic manner that lends itself to generic solutions. This makes business solutions transferable across industries.

Many of these ideas are recast within an Operations Research (OR) framework. This led to new concepts and a new approach to business strategy.

For example, at the time, 1987-1992, I had shown that both push and pull systems were equivalent. That is, it is not possible to gain a competitive advantage over any other industry player by switching to a pull system of managing work in progress (wip) within a factory. Yes, pull and push are equivalent. The real issue is planning complexity. This concept is derived from a class of OR search techniques known as mathematical programming discussed in chapter 6, *Push versus Pull Systems*. This planning complexity is evidenced by the fact that by the mid-1990s the semiconductor industry as a whole had given up the possibility of migrating to a pull system of managing wip.

The past 15 years I have been engaged in the financial services industry. Initially, building Commercial Mortgage Backed Securities (CMBS) statistical loss vector models for major investment bankers, GMAC Commercial Holdings and Goff Capital, and later underwriting Commercial & Industrial loans for regional banks, UMB and Key Bank. I found some of the financial risk methodologies wanting and have just barely touched on some of these in this book. To address all the issues in our financial risk methodologies would require a substantial treatment not possible here.

4 Expected Benefits

In writing this book, I've taken a high level, big picture perspective, for senior managers, and then come down to the details pertaining to the relevant issues, for junior managers. I do hope that the book will enable practical managers to quickly straighten out their operations as they can now see that the real issues are related to operations and business design and not to uncooperative functional departments.

For example, in a Fast Moving Consumer Goods company, if forecast market demands are used to determine production schedules, it will create an environment of hostility as marketing, sales, planning and production will not be able to satisfy changes in the forecast market demand. Forecasting, by its nature, guarantees that changes in market demand, is always unexpected. Unfortunately, the need for management accountability ensures conflict and that the

politically *weakest* department will take the blame for stock-outs and excess production.

Further, the new approach to business strategy, the Holistic Business Model, allows one to clearly see the competitive forces facing one's business; and those forces affecting one's competitors, *using only public information*. Like chess, all the locations to move to are known, so are the rules. Your opponent can see your possible moves several steps ahead and yet the game is sophisticated. Similarly with the Holistic Business Model, all the structural positions are known, and so are the migration strategies. The upshot of this is that, not only do you know your own best strategy, but that of your competitors, too, and vice versa. The Game of Business is going to be a very interesting one, where all players know each other moves! And we will not be limited to just *low cost*, *differentiation* and *niche*.

Wherever possible, I cut through the *bull* and provide working answers to management questions about how an issue should be approached and what are the real solutions to their problems.

God bless.

Benjamin T Solomon
Denver, Colorado
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I would like to thank Ralph Kugler, then Chairman of Unilever Malaysia, and later President and CEO of Unilever Foods North America, and Director on the boards of Unilever PLC and Unilever N.V.

He gave me the opportunity to present the 6-month Demand Driven Inventory Management (DDIM) project to the board of directors of Unilever Malaysia, at that time a US$110 million Fabric Wash company. They accepted this radical approach. DDIM increased service levels, eliminated stockouts and overstocks while reducing the maximum time from order taking to sales delivery from 50-days to 3-days.

I would like to thank David Smith, then Managing Director of Texas Instruments Malaysia (a US$1.5 billion Assembly/Test operation in the early 1990s), and later CEO of TECH, Singapore, a joint venture whose shareholders are now, Micron Technology, Canon and Hewlett-Packard. He fostered an innovative environment that allowed me to pioneer, develop and implement:

[1] Engineering Yield Systems (coded in PASCAL), under the guidance of then Engineering Department Manager, Vincent Leang, that led to increased Assembly/Test yields from 85% to 99.9% within 5 years. Today, we would describe this effort as Business Intelligence.

[2] HSM Parts Per Million Tester Capacity mathematical models (implemented using Quattro Pro spreadsheets), under the guidance of then Engineering Section Manager, Tan Eng Keong, that led to a 30% increase in tester capacity without additional equipment purchases.

[3] Daily Factory Starts (DFS) planning system under the guidance of then MIS Department Manager, Surkunalingam, MIS Section Manager, the late Saw See Seik, and Project Manager, Richard Bombet from Texas Instruments corporate headquarters. This system reduced Assembly/Test cycletimes from 5 days to 3 days.

I detailed the integer programming mathematical model and implemented the constraints manager in MS SQL. Stanley Oh wrote the C, integer programming search engine, and Ray Chan of Texas Instruments Philippines,

wrote the DSW interpreter to generate the SQL code for the constraint manager.

I implemented this system at both Texas Instruments Malaysia and Texas Instruments Philippines, before leaving for Coopers & Lybrand Management Consultants.

I would like to thank, Gnanalingam, then Vice Chairman of Westport Malaysia, who brought me in as Head of Corporate Planning and gave me free reign to do what it took to get the sea port operations up and running. I invented the 7-hour hinterland strategy, implemented Fast Port and redesigned all port tariffs and business processes to change management's focus from container moves to container delivery. Effectively reducing wharf-to-gate dwell time to less than an hour. A dwell time that was unheard of, at that time. Today, Westport Malaysia ranks 12th busiest in the world.

I determined that Felix Stowe port in the United Kingdom had the best port design, and advised Cambodia on how to select port designs.

We visited with then President of Sri Lanka, Mrs. Chandrika Bandaranaike Kumaratunga, and Minister of Transportation, Ashraf, to propose the development of Trincomalee port, on the eastern seaboard of Sri Lanka.

Contents

Part 1:
Introduction

1. Introduction

1.1 Theory Versus Practice

As this book is about business design, it covers both business reengineering and business strategy. Part 2, Operations, details for the first time how and why an operation works. It lays out a mathematical basis for factory operations and relates this mathematical basis to practical management problems found in manufacturing companies.

I bridge the gap between practical managerial experience and academic thought. Managers will tell you *Never mind the theory, does it work in practice?* Academics have an equally valid perspective - *It's O.K. if it works in practice but does it work in theory?* This book ensures that both perspectives are met - a mathematically robust basis for practical operations management.

The mathematics found in this book, ensures the integrity of logical thought and is mostly at a conceptual level - there isn't any significant mathematical derivation. One will find that the mathematical foundation helps to clear much of the confusion and myths in manufacturing. The mathematics is used to infer the correct approach rather than to prove an existing point of view.

1.2 The How of Business Reengineering

Part 3, Tools, is a discussion of tools I had developed during my many years reengineering businesses. It stems from the recognition (and frustration) that process mapping is an insufficient and inadequate tool for business reengineering. These tools form the basis for understanding a business and formulating strategy. It is done from the perspective of the structure of the business and what that structure is capable of achieving.

One of the basic tenets I use in business reengineering is that benchmarks should be exceeded rather than merely met. Benchmark indices, I believe, simply tell us what we should have achieved yesterday. Gary Hamel, in *Reinventing the Future*, explains, "Simply catching up to where others have been is necessary to stay in the game, but I believe that the winners will ultimately be those with the ability to invent fundamentally new games".

Business reengineering is not about achieving status quo with the best, its about achieving the best a company's business structure will allow even if it means being 30 times better than the best. Yes, some companies are afraid of being better than the best. For example, in Chapter 13, *Notes on Reengineering* we see how network diagrams can be used, instead of benchmarks, to determine what a business should be capable of achieving within the environment of the commercial world. These network diagrams allowed us to set achievable objectives that were far superior to those derived from benchmark indices. At the same time, network diagrams, provided a clear understanding of how specific objectives would be achieved within the context of the business being reviewed, and not that of some other benchmarked business.

1.3 An Alternative Structure to Strategy

Porter, in his article, *Toward a Dynamic Theory on Strategy*, explains that structure is built around five competitive forces - rivalry, new entrants, substitutes, buyers and sellers. In this book, I propose that design determines structure and structure determines forces. This is a more empowering position to take, as it hands the reins back to management. It allows management to recognize what their competitors are and are not capable of, just by examining the structure of their businesses. Therefore, it is imperative that one understands why and how one ought to design a business.

In Part 5, Holistic Business Model (Operations, Revenue Transactions and Business Management) I propose a three-layered approach to business design. Business Management layer sits on top of the Revenue Transaction layer, which in turn sits on top of the Operations layer. Each layer consists of four frameworks. A framework is a conceptual approach, which establishes a mechanism to present and discuss structure, cause and effect, strategy and barriers in a holistic manner. Thus providing a complete visual presentation of an aspect of the business environment.

Each framework consists of four structural strategic positions a company can occupy. There are 256 different permutations for the operations and revenue transaction basis of a company, respectively. Together they form 65,536 types of business structures that generate revenue from their operations. The Business Management layer consists of a further 128 permutations. In total there are 8,388,608 unique permutations of businesses in the competitive arena. What

do all these numbers mean? They demonstrate that only twelve frameworks define an extremely large opportunity set of business structures. That is, it is possible to manage an almost infinite number of volatile entities in the business environment just by examining twelve frameworks. The proposed approach to business strategy makes the seemingly impossible, humanly possible to manage.

1.4 Frameworks Approach to Strategy

In his same article, Porter relates, "One of the great mistakes that has been made over and over again by companies is the attempt to apply a universal strategy." This is very true. Frameworks approach to business strategy show that a company needs to identify at least 12 structural positions and at most 12 strategies to compete successfully in the competitive arena. There is no universal strategy and there is no optimum business entity. The optimum business fit changes with what is desired, with what is suitable for it's environment and when these requirements arise.

A second advantage of the framework approach is that it ensures that management does not make incorrect strategic decisions. For example, one cannot migrate from Push Scheduling Management to Made-To-Order, as both structural positions are in different frameworks. Push Scheduling Management belongs to the Scheduling Management Framework and Made-To-Order belongs to the Availability Framework. As a result, one need only focus on that framework that is relevant to one's business decisions. Frameworks have decoupled many apparently interconnected issues into a few relatively isolated issues.

A third advantage is that there aren't any *new* types of businesses. The Internet business model is the mail order business model with much more sophisticated technology. Internet and mail order businesses belong to the Virtual structural position in the Format Framework.

1.5 The Dynamic Nature of Strategy

Porter states, "A good strategy is concerned with structural evolution of the industry as well as with the firm's own unique position in that industry." Agreed. The framework approach is not static, it is a dynamic approach to strategy as it allows one to cycle through various structural positions as and when the environment changes.

Each framework can be reviewed independently of any other. There is no optimum position. It is open-ended.

Because it is open-ended, a strategic plan is not a set of fixed targets to be achieved by a set time frame. A strategic plan is a set of milestones to be achieved upon the realization of a particular set of events. Strategy is like a chess game, one cannot make the next move until it's your turn. Similarly, one cannot make strategic change until the framework enables you to do so. The framework approach ensures that management is always looking for the next relevant structural position they need to achieve, if at all, and when it's due. The *migration* to this relevant structural position is the strategy to be implemented.

1.6 Conclusion

C.K. Prahalad in *Strategies for Growth*, advocates, "It's not enough to imagine the future - you also have to build it." This book demonstrates how one will convert a strategy into the logic of the business and directly into operational design and the other way round.

Part 2:
Structure of Operations

2. An Overview to Operations Design

2.1 Evolution of the Need for Strategy

An operation is related to and relevant to business strategy. It is the basis for the need for business strategy. Most businesses start as small businesses, where the means of generating revenue, operations, is more important than sophisticated business strategy. As an operation becomes successful, management turn their attention to the strategic context of their business.

In this section we look at how an operation is designed. In so doing, discover that scale economy is an operating characteristic of the factory. That is, the structure of an operation gives rise to opportunities in business strategy. This is a bottom-up approach to business strategy.

2.2 Example

For example, the operating design of factory will determine how management will respond to market pressures. Consider two different factories *F* & *S*, each having the same capacity. Factory *S* has many slow machines. The other, Factory *F*, has few fast machines.

Factory *S* is able to respond quickly to urgent orders as these orders can be easily expedited because many machines are available at any time. This environment allows for bypassing the *normal* flow of wip. However, for the average lot, the total lead-time from order to delivery is longer than that of factory *F* as factory *S* has slower machines. The ability to handle *urgent* lots comes from the operational capability to *jump the queue*.

For the average lot, factory *F* is able to consistently operate with shorter total lead times than factory *S* because its machines are faster. However, as there a few machines, factory *F* is limited in its capability to handle urgent orders. Its operation has little physical opportunity for *queue jumping*.

The management of factory *S*, is therefore, more likely to accept *rush* orders. Management at factory *F* is more likely to focus their marketing campaigns on consistency and reliability in delivery. Factory *S* will focus on spatial process control, i.e. process control related to material movement and factory layout. These are wip-handling issues. Factory *F* will focus on temporal process control, i.e. planning and production control issues related to scheduling.

2.3 Key Concepts

Operations design is not about engineering process design. Neither is it about factory design nor equipment design. It is about how these three design considerations are brought together to effect a smooth transformation of inputs to outputs. It is about synergy at the operating level of the business.

From an operations perspective, four key concepts are critical to effective operations design. They are,

1. Operating Discipline: This is the ability of an operation to adhere to a production plan. Both under and over achievement are not good. Under achievement results in revenue loss. While over achievement results in inventory build-up. Both situations indicate management's inability to control their operations. If one cannot control operations, one cannot be responsive and therefore, cannot respond to market changes.

My experience suggests that lagged or late responses to market changes are almost entirely due to,

- Too much management control of an operation. This is usually an operation where management perceives achievement in terms of how much work they have done and not in terms of what objectives they have met.
- An operation that is not designed to work correctly and effectively. This is addressed in this first section of the book.

Operating discipline is a management's ability to steer, motivate and control an organization; and production staff's ability to work, in a timely and responsible manner with respect to implementing a production plan. This is the ability to adhere to a feasible and viable production plan. A production plan that can be executed (feasible) and whose integrity can be maintained (viable) during its execution.

2. Problem Integrity: When a production plan is generated, it is done so within the context of factory parameters (machines, piece parts, etc.). These parameters form the basis of the planning problem that was formulated and its outcome solution is the production plan. In problem integrity, the operation has at some or many instances modified the factory parameters so that the solution, the production plan, being implemented is no longer relevant, as the problem has *been changed*. Problem integrity ensures that the production plan remains feasible within its planning horizon.

This second concept in operations design is vital to smooth transformation of inputs to outputs. In almost every factory I've

visited this has been a source of problems. However, its impact is enormous in large factories where it is least understood.

One solution to the feasibility issue is to ensure that the production plan being implemented is insensitive to small changes in factory parameters (or small changes to the planning constraints). This can be quite a sophisticated exercise. The practical alternative is to ensure that realistic and accurate factory parameters, and even slightly less bottleneck capacities are used to develop the production plan and that process integrity be maintained.

3. Process Integrity: This is the ability of a process to perform consistently in a repeatable manner. Not in terms of quality specifications but in terms of transforming inputs, from a predetermined plan, into outputs within predetermined capacity utilization and delivery dates.

Cycletime and capacity utilization spreads are ideal indices to measuring process integrity. The more a process is unable to consistently deliver outputs the greater these spreads are. A correctly reengineered process is stochastically dominant over its previous process characteristics. A reengineered process is said to be stochastically dominant over its predecessor process if it returns a higher probability of achieving some minimum target level, at every level, than its predecessor process. (See chapter 13, *Determining Reengineering Objectives*).

Operations process integrity is not engineering process integrity. Operations process integrity requires accounting like *handshakes* to ensure effective and timely transfer of wip. Process integrity ensures that the production plan to be implemented will remain viable within its planning horizon.

4. Process Synchronization: This is the ability of all points in the process to synchronize their process rates. This is not line balancing. In line balancing neighboring process points are set up to have matching capacity availability. This is a static approach to ensuring smooth wip flow. In process synchronization, a balanced line slows down and speeds up in a coordinated fashion. This is not necessarily concurrent. The key is the ability to coordinate their process rates together, in an asynchronous manner.

2.4 Reengineering a Process

Later in this section, we will look at how reengineering objectives should be determined. The concept of stochastic dominance is uti-

lized. A reengineered process is stochastically dominant over its predecessor if it presents a lower cumulative probability of some minimum desired target, at every target level, than its predecessor process. If this is not achieved to a significant degree, then the reengineering effort has been ineffective.

To effectively reengineer a process, one needs to dissect the process to understand it's spatial and temporal control capabilities with respect to its business's requirements. This is not done in existing reengineering methodologies. This vital step ensures the feasibility and viability of the reengineered process.

3. Factory Operating Issues

3.1 Summary

Incorrect lot-to-machine assignment and non-First-In-First-Out (FIFO) wip staging cause lot arrivals to behave in a random manner by increasing cycletime spreads. This in turn causes scheduling problems and loss of capacity utilization. Robust lot-to-machine assignment and FIFO wip staging are essential to controlling cycletime spreads.

3.2 Manufacturing Objectives

There are only three manufacturing objectives, product delivery, product-quality and process wastage. Overhead utilization is a capital expenditure (capex) issue and therefore, strategic in nature. Once capacity is built in, it makes little sense to devote tactical, short-term, operations and planning management, resources to strategic, long-term, capex related resources.

3.3 Scope

Process failures or inefficiencies will manifest as increased wip, cycletime, wastage and reduced quality. This book is not concerned with quality as a manufacturing objective. Therefore, it assumes that the factory does not have significant yield, quality or product related problems.

3.4 Problem Origin

A unit of operation, sometimes know as a process point, consists of wip staging and equipment areas. Change in the amount of wip at staging is due to differences in the arrival and departure rates of product flowing through a process point. That's the theory. In practice, it is also due to the mismatch of incoming product mix with existing equipment configuration at a given process point. These problems are caused by,

1. **Altered product mix:** The existing equipment mix, at a given process point, no longer matches the required equipment capacities for the incoming product flow mix, as this product mix was altered by an earlier process point.
2. **Incorrect machine configurations:** The existing equipment mix, at a given process point, was not altered in time to accommodate its incoming product flow mix.

In both cases, the outgoing product flow mix no longer matches the planned product flow mix for the subsequent process point. Altered product flow mix results from incorrect equipment capacity allocation or incorrect lot-to-machine assignment at some earlier process point. Incorrect lot-to-machine assignment (first scenario) occurs when production personnel have the jurisdiction to override production plans without sufficient justification. Incorrect capacity allocation (second scenario) results from unexpected set-up time delays, equipment breakdown or simply, an inability to reconfigure machines (third scenario) as quickly as the product mix is changing.

In the first two scenarios, either the lot-to-machine assignment system needs to handle deviations from the required product mix or the factory must have sufficient excess machine capacity to cushion these deviations. In the third scenario, management needs to implement set-up time reduction programs before reviewing the situation.

3.5 Operating Discipline

In almost all cases, however, over riding the production plan should not be allowed. The need to override production plans result from human error; error in foresight; error in planning; error in managing; error in supervising; error in understanding. Thus, *Operating Discipline*, the ability of an operation to adhere to a feasible and viable plan, can be measured by the degree of deviation from the original production plan over its planning horizon.