Applying System-Wide Discovery Analysis to the Market Growth model

presented by

Annabel Membrillo, James L. Ritchie-Dunham, Conrado Garcia Madrid
The Strategic Decision Simulation Group
http://www.sdsg.com/

ABSTRACT: *In the sixties, an insightful model about market growth was built by Jay W. Forrester. A causal diagram based on this model was analyzed with the System-Wide Discovery process. The objective was to gain deeper understanding into the market growth structure to answer the following questions: (1) What are the variables with the most leverage affecting and limiting market growth? (2) How should management design the company structure to grow sales sustainably in an unlimited market? The informal and formal goals and subgoals were analyzed along with how performance indicators incentivize the behavior of each player. The key intervention points with the highest leverage were identified. We studied (1) where and how the areas affect each other, (2) how they use shared resources, principally sales and production, (3) the role management plays and (4) the impact of the market within the system. The four sections of the paper are: an introduction to System-Wide Discovery, an overview of the model, the analysis process and the findings.*

INTRODUCTION TO SYSTEM-WIDE DISCOVERY[1]

System Wide Discovery, the first phase of the Systemic Leverage process, offers a rich approach for managers to deepen their understanding of the nature and impact of the key cause and effect relationships driving performance in their organization, from three distinct perspectives in the systems: global, local and integrative. The global perspective represents the "owners" of the system - the ones held responsible for the overall global behavior of the system and for providing corporate resources. The local perspective is represented by the "participants" in the system - the ones that are responsible at the tactical or local level for using local and corporate resources to get things done. The integrative perspective is represented by the "management" of the system - the ones responsible for designing structures that integrate the local level activities to achieve the global goals.

In dynamically complex environments, Systemic Leverage helps managers deepen their understanding of the nature and impact of the key cause-effect relationships driving performance in their organization. High leverage comes from designing into the company structure the ability to focus, consistently, the right resources efficiently on those efforts that will allow the organization to achieve its goal sustainably.

[1] For more explanation, see the book *Management for Clarity* written by James L. Ritchie-Dunham and Hal Rabbino, being released in 2000, http://www.sdsg.com/.

The Systemic Leverage framework has three main areas of concern that we are trying to improve:

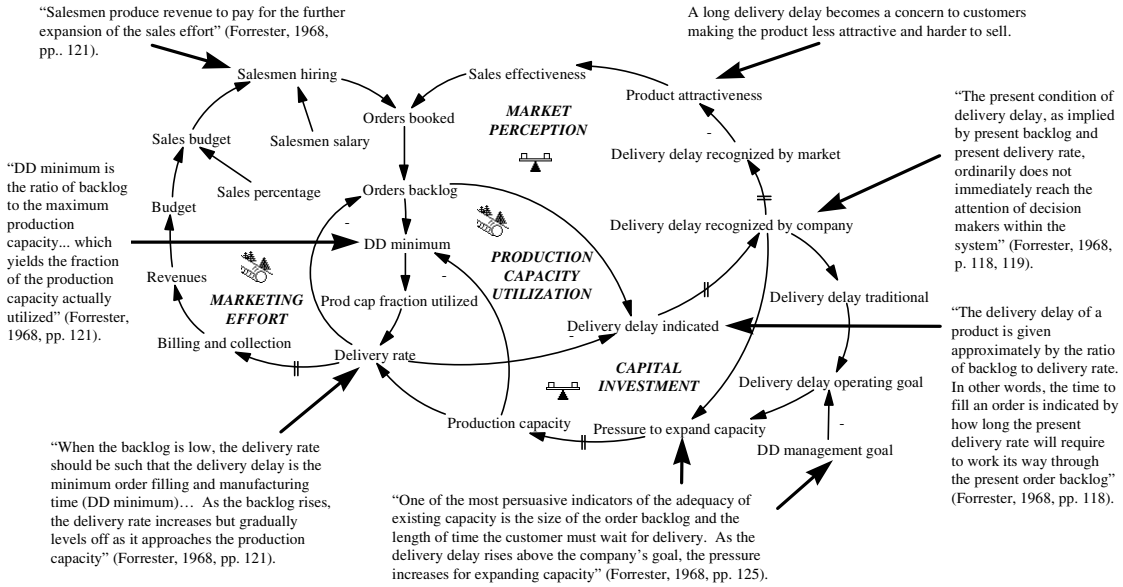
1. our understanding of the system
2. our ability to communicate effectively this understanding in order to effect change
3. our ability to move the system in the desired direction.

Our objectives in "System Wide Discovery," the first phase of the Systemic Leverage framework, are four-fold:

1. to capture knowledge of the system's resources and their interrelationships – how the system works
2. to integrate this knowledge into a single model
3. to analyze and understand how to leverage the resources in the system
4. to initiate dialog into system design

THE MODEL

The Systemic Leverage analysis was applied to the following model. The model was built based on the market growth model of Forrester (1975).



Source: Forrester, J.W. 1975. "Market Growth as Influenced by Capital Investment," *Collected Papers of Jay W. Forrester*, Portland, OR: Productivity Press.

Figure 1. Causal Loop Diagram for the Market Growth Model.

SYSTEM-WIDE DISCOVERY PROCESS

When starting a Systemic Leverage analysis, we address "the question" that challenges a group of the client's experts. They want to change the behavior of their system. To achieve this change, they must first understand how the system works, and why it behaves as it does. In this case, the question was defined based on Forrester's article: how should management design the company structure to grow sales sustainably in an unlimited market?

In order to answer that question, the first step is to understand the global goal. The following maps depict the stated system goals and subgoals network of the system, determining the degree of structural leverage (alignment) that exists. The fundamental goal of *Maximize revenues* is achieved by the subgoals *Maximize sales growth* through *Maximize orders booked and production* (figure 2).

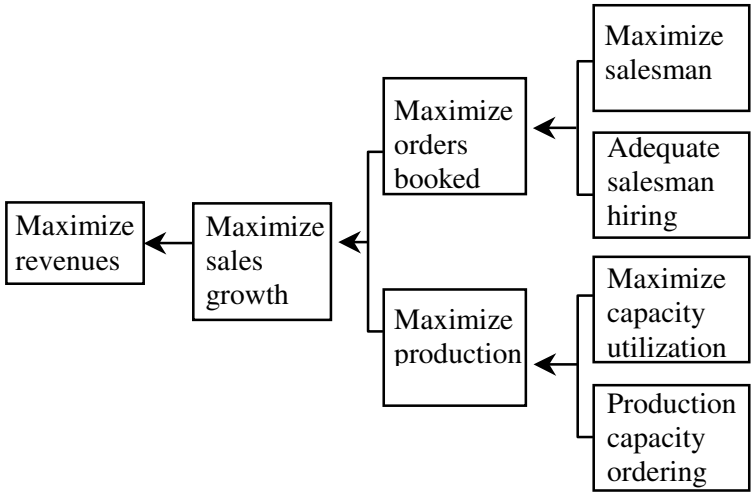


Figure 2. Stated Goals and Subgoals for the Market Growth Model.

System-Wide Discovery includes a suite of tools and methodologies to mine information from the model. In this case, we are only going to show the ones that we think add more to the current findings of Forrester. Applying SDSG's tools and methodologies (Ritchie-Dunham, 1997) the following insights were obtained:

Archetypes[2]

Daniel Kim showed in *The Systems Thinker* (1998) that the "Growth and Underinvestment" archetype best captures the spirit of the market growth model (see Figure 2). In this archetype, by trying to grow demand quickly, while waiting to add capacity, the firm's growth is limited by its capacity.

[2] The archetypes and SVOM results were presented previously in a forthcoming *Systems Thinker* article "A Systemic View of the Organizational Map" written by James L. Ritchie Dunham and Annabel Membrillo.

This archetype teaches us that instead of pushing on growth (through *Orders booked*) to increase revenues, the company should invest in *Production capacity* to meet customer delivery requirements, and thus allow growth. In systems thinking terms, the "market perception" balancing feedback loop limits the ability of the "marketing effort" loop to grow. Quite simple, yet not intuitive, as evidenced by the number of firms that fall into this systemic trap.

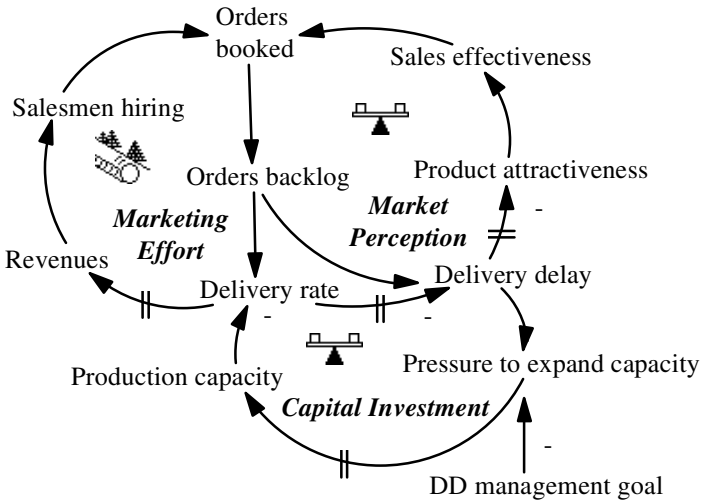


Figure 3. Archetype for the Market Growth Model.

Now that we have the insight gained from the archetype, what can we do about it in the organization? What organizational structures and incentives might be creating the problem today?

Systemic View of the Organization Map (SVOM)

Further analysis of the causal model provides insight into the key factors that affect performance in the system and provide a basis for reconfiguring departmental performance indicators. The SVOM analysis, which overlays the causal model with organizational or departmental boundaries, often highlights points of conflict where one department has strong influence on resources affecting another department far down (or up) the business chain. Interfaces between departments, shared resources, become candidates for sharing or shifting responsibility for this issue or resource between the departments.

We can identify in Figure 3 how each group within the organization has what seems to be very rational, local goals. This diagram describes the formal and informal incentives for each group's behavior within the system. The double-lines represent permeable boundaries across which groups share "common resources."

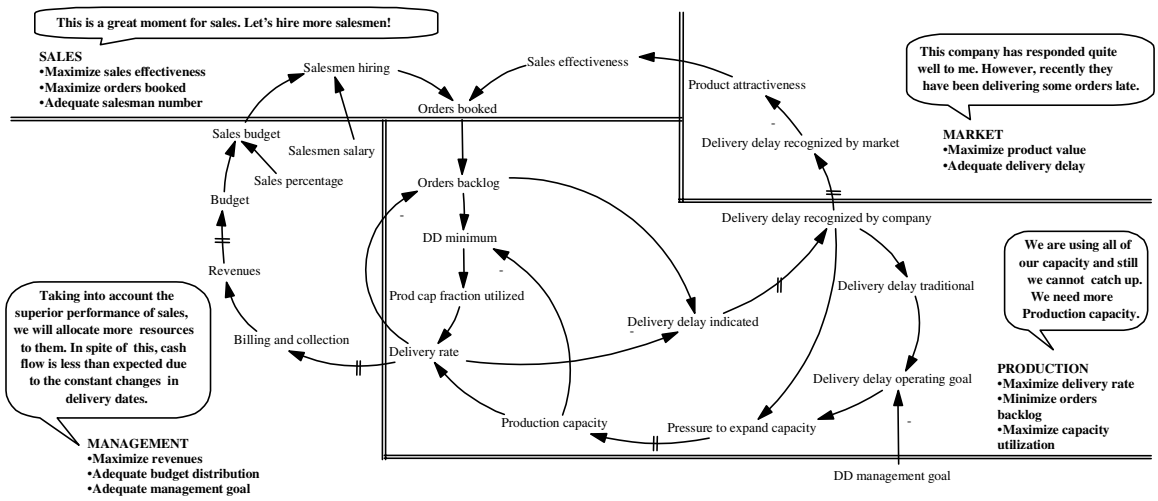


Figure 4. SVOM Analysis for the Market Growth Model.

The SVOM analysis shows clearly that the Sales group is paid to maximize the *Orders booked*, which makes sense, it's their job and what they do well. The Production group is paid to maximize capacity utilization and thus delivery rate, within their capacity constraints. Again, this makes sense, since they are very good at optimizing their utilization. However, when we connect the two local perspectives, in the system, we see that the long delays and resource allocation to the groups based on the department performance exacerbate the differences among the capacities of the groups, affecting directly the global performance. Different groups control these strategic resources in the system. Let's look more closely at these relationships and how each group perceives them.

SVOM Relationship Assessment

Relationships between the main actors in a system include multiple facets, from supplier to customer, from independent to shared resources, and from alliances to conflicts. The SVOM Relationship Assessment describes the relationships that exists between the different actors in the system, from each of their perspectives.

Most relationships between departments or subsystems are reciprocal. In some cases, I am the supplier and you are the client. In other aspects of our relationship, you are the supplier and I am the client. An initial assessment of these relationships provides insight from three perspectives:

1. What each group thinks they are trying to achieve (their Objectives and main Problems)
2. How each group sees their relationships with the other groups in the system (Supplier and Customer relationships)
3. The differences in perception from one group to another, on the same supplier and customer relationships.

We have found, in organizations, that blame for problems often accompanies misaligned perceptions. This exercise makes those relationship perceptions explicit so that they can be examined, and so that we can analyze the effect those differences have on the behavior of the overall system. This provides a crucial step in the design of effective systems. In the market growth model, we can see that great differences exist amongst the perspectives each has on the relationships they have with the other groups (see Table 1).

Actors	Salesmen	Production group	Management group	Customers
Salesmen	O: sell as much as I can. M: orders booked P: insufficient product to deliver and demand decline	S: gives orders C: late deliveries SR: orders	S: none C: receive sales budget and salesmen salary SR: budget	S: customer relationship C: orders, sales effectiveness SR: orders
Production group	S: orders fulfillment C: they sell more than we can produce SR: orders	O: maintain delivery delay close to the management goal M: DD indicated P: undercapacity	S: none C: receive production budget to increase capacity SR: budget	No relationship
Management group	S: sales budget assignment C: cash flow generation SR: budget	S: production budget assignment C: orders to bill and collect SR: orders and budget	O: maximize revenues M: revenues P: sales decline	No relationship
Customers	S: orders C: product awareness SR: orders	No relationship	No relationship	O: buy the best product to fill my need M: product value P: delivery delay increase
O: Objective, M: Measure, P: Problem, S: Supplier, C: Client, SR: Shared Resources				

Table 1. SVOM Relationship Assessment for the Market Growth Model.

As a conflict, we discover that the local objective of salesmen, *sell as much as I can*, affects the ability of the production group to achieve their local objective with the available capacity, *maintain delivery delay close to the management goal*. The misalignment of this goals bring in problems for both actors, blaming each other for their problems. The Sales group perceives that, as a supplier, they provide Production with orders and that, as a client, late deliveries from Production affect their ability to sell more orders. On the flip side, the Production group perceives that they have to fulfill the orders, and that, as a client, they receive more orders from Sales than they can deliver on time. This misalignment ensures that there are probably very weak communication channels between Sales and Production, even though their relationship directly affects at least two key resources – "capital invested in capacity" and "customer base."

Global Goal Analysis

Analyzing the stated goals we defined at the beginning of this section, now we can determine the degree of structural leverage (alignment) that exists. The actual goals tell a complete different story than the stated goals (figure 5).

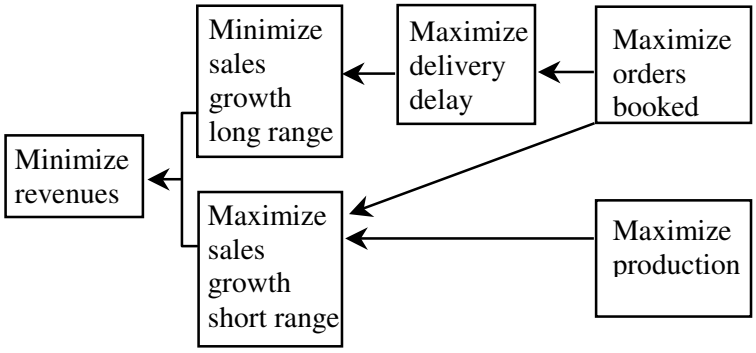


Figure 5. Actual goals and subgoals for the Market Growth Model.

We see low structural leverage because the subgoals do not enable the system to achieve the global goal. *Maximize orders booked* provokes a greater *delivery delay*, over time. As a result, the means objective or goal of *Maximize orders booked* maximize sales in the short range, but in the long run it is minimizing sales! The misaligned goals, as analyzed in the actual and stated system goals networks, will not allow us to achieve our goals, consistently and sustainably.

Influence/Exposure analysis

The variables with the most leverage were *Production capacity*, *Orders booked*, *Production capacity fraction utilized*, *Orders backlog*, *Delivery rate*, *Delivery delay indicated*, *Pressure to expand capacity* and *Delivery delay recognized by company*.

Almost all the high-leverage variables are the responsibility of one department, Production. Most of them have long delays. *Production capacity* is the main limit to *Sales growth*, and *Orders booked* is the main driver pushing or depleting growth. The question that arises here is how to involve all the parts of the company to control deliveries, delays and backlog accumulation? The following analysis goes deeply into a potential answer to this question.

Performance indicators

The following table summarizes the traditional performance indicators for each group within the model, the proposed performance indicators based on the current analysis, and core competencies developed as a result of the proposed indicators.

Functional Area	Performance Indicators			Proposed Core Competencies
	Traditional	**Proposed Lagging Indicators**	**Proposed Leading Indicators**	
Sales	Orders booked	Average orders booked per salesman Average orders booked per salesman hired Orders backlog	% Change of orders backlog % Change of orders backlog per salesman Delivery rate Time to recognized delivery delay	On time deliveries Sustainable sales growth
Production	Delivery rate	Average delivery delay % Utilized capacity Orders backlog	Time to extra capacity delivery % Change delivery delay Production capacity remained DD minimum	Lack of capacity prevention
Finance	Revenues	% Change of revenues Total sales per collect % of sales collected per period	% Sales budget % Capacity expansion budget Collection delay % of orders backlog collected per period	Efficient budget allocation Collection effectiveness
Customer Service	Product attractiveness	Customer satisfaction order Product attractiveness index	Average time to deliver Time to recognized delivery delay	Customer retention

Table 2. Performance Indicators for the Market Growth Model

With the traditional indicators, the Sales group's incentive is measured by salesmen performance with orders booked. Therefore, each salesman sells as many orders as they can to improve performance and remuneration. Production gets in trouble because they deliver as much as they can with the production capacity, however, the fact that orders backlog is increasing and delivery rate stated remains the same, affects production performance.

Since salesmen determine the flow that accumulates orders, they need to be aware of actual production and backlog changes to avoid over sales and deliveries out of schedule. Also they need to monitor sales efficiency and how these efficiency changes with each new salesman improve hiring decisions. Production needs the information to determine when extra capacity will be needed, taking into account the time it will take to bring on the capacity. Even management needs to follow sales and backlog to improve investment decisions. To give excellent service requires customer information, as well as careful monitoring of delivery times. The proposed lagging and leading indicators imply more and better information available for decision makers within the system, leading to different core competencies within the company.

HOW TO DESIGN A BETTER STRUCTURE?

System-Wide Discovery helps design structure to get the results we want. Through the System-Wide Discovery, we increase our *understanding of the system* by increasing our understanding from the global, local and integrative perspectives. Developing a single, integrated causal diagram, we increase our *ability to communicate the understanding*. Moreover, looking at the results of the Systemic Leverage analysis, we increase our *ability to move the system*.

The importance of management's role arises when we think about designing the company. The existing organizational design has a great impact on our ability to achieve local and global goals. Management needs to be aware of how the rational, local perspectives create serious communication barriers between groups, and how the structure and incentives in a system promotes locally rational behavior often to the detriment of the whole system. Understanding the goals, incentives, and culture each area has and how they affect their behavior, the inherent dynamics and the available resources we have, the task of designing a better company is just getting started. Once we understand deeply where the leverage points are, potential unintended consequences of our actions and how we affect others and others affect us, we are on the right path for starting organizational design.

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