A STRATEGIC ANALYSIS OF THE ORGANIZATIONAL STRUCTURE FOR VEHICLE DEVELOPMENT AT GENERAL MOTORS

by

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ABSTRACT

General Motors instituted a strong, single-point program management system for 
vehicle development in its North American Operations (NAO) on January 1, 1996. This 
system features a Vehicle Line Executive (VLE) as the heavyweight program manager who 
is responsible for integrating customer and product requirements for car lines in a given 
market segment. To accomplish this integration, the VLE uses a multi-functional team to 
direct the activities of numerous functional areas throughout GM.

This thesis analyzes this organizational structure for vehicle development by using 
a strategic management framework which considers the integration of strategy, structure, 
processes, measurements, and culture of a company. An assessment of each element in the 
framework is performed.

These assessments are derived through available company information and through 
interviews conducted with managers at GM. Supporting examples from the current 
literature on strategy and organizational structure for product development are also 
referenced.

The thesis concludes with a proposed global organizational structure for vehicle 
development and discusses the challenges facing GM in implementing this structure.

Thesis Supervisor:  Arnoldo C. Hax
Title: Alfred P. Sloan Professor of Management
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Gregory R. Bellopatrick
CHAPTER ONE
INTRODUCTION

Effective product and process development requires the integration of specialized capabilities. Integrating is difficult in most circumstances, but is particularly challenging in large, mature firms with strong functional groups, extensive specialization, large numbers of people, and multiple, on-going operating pressures. In these types of firms, product development projects can be the exception rather than the primary focus of attention. Even people working on development projects find that years of experience and established systems which cover everything from career paths to performance evaluation, from reporting relationships to breadth of job definitions, create both physical and organizational distance from other people in the organization.

The functions themselves are organized in a way that creates further complications. The marketing organization may be based on product families and market segments. Engineering could be organized around functional disciplines and technical focus, while manufacturing is a mix of functional and product market structures. The result is that in large, mature firms, organizing and leading an effective product development effort is a major undertaking.¹ This is especially true for organizations whose traditionally stable markets and competitive environments are threatened by new entrants, new technologies, and rapidly changing customer demands.
A BRIEF HISTORY OF GENERAL MOTORS

The ability of General Motors (GM) to develop vehicles that satisfy specific customer needs is a strategic thrust that was established by Alfred P. Sloan and dates back to the 1920s.\textsuperscript{2} The execution and program management of this strategic thrust has proven critical over the years. The history of GM has had significant influence on the evolution of program management for vehicle development, and this history has created an "administrative heritage"\textsuperscript{3} that constrains a company's ability to respond to the changing demands of strategic tasks. Therefore, significant considerations will be given to the early history of the formation of GM and the most recent developments.

The General Motors Corporation was incorporated under the laws of the State of Delaware on October 13, 1916, but in actuality the biggest of the Big Three automakers was born on September 16, 1908 when the General Motors Company was chartered in New Jersey.\textsuperscript{4} The original GM was not a manufacturer, but simply a holding company that controlled other firms that made motor vehicles and related items through its stock holdings. Unlike Ford, GM resulted from the acquisition of existing companies and their eventual consolidation into one corporation rather than from the development and growth of a single automobile manufacturing firm. As such, GM is one of the most successful examples of the movement toward merger and consolidation that has so often characterized American industrial development over the past century.\textsuperscript{5}

GM's creator was William C. Durant, who had taken part in negotiations in the early months of 1908 to merge Buick, which he controlled, Maxwell-Briscoe, Ford and Reo. When these negotiations collapsed in the summer of 1908, Durant went ahead on his own
to form the General Motors Company. GM was organized under the laws of New Jersey rather than of Michigan, where Durant and his company were located, because New Jersey’s corporation laws permitted one company to own stock in another company. By the end of 1909, Durant had gathered under the GM umbrella 22 independent businesses including Buick, Oldsmobile, Cadillac, Oakland, Ewing, Marquette, Welch, Scripps-Booth, Sheridan, Catercar, Elmore, Ranier, Rapid and Reliance. The rapid, almost impulsive, acquisition of smaller car companies was the most significant characteristic of Durant and the early GM. As many of the firms were weak and financially shaky, GM suffered from the resulting strain on finances.

Durant lost control of GM twice, the first time in 1910, as a result of the company’s wretched financial condition. A banker’s trust took over management of the firm and Durant left to found Chevrolet. In 1916, Durant returned to GM with his Chevrolet Company, acquiring GM through the exchange of Chevrolet stock for GM stock. In 1918, GM in turn acquired Chevrolet and with Durant again in control, began another series of acquisitions. Although most of the companies acquired during this time brought great benefits to GM, the added financial burden heralded disaster when the economy slumped in 1920.

One of Durant’s great problems was his penchant for autocratic control. During the early years of GM, this management style was beneficial because it gave Durant the power to make needed decisions. It also gave Durant the opportunity to make serious mistakes. In addition, the growing size of the company made it increasingly difficult to coordinate the various divisions or even to gather information. The underlying weakness of the company was revealed in the 1920 depression by GM’s plummeting sales.
Durant’s dealings in the stock market caused complementary problems. As the market faltered, Durant invested more and more cash in order to support and stabilize the price of GM stock. When the bankers learned that GM was in serious financial trouble and that Durant was also near personal bankruptcy, the company’s founder was persuaded to leave GM.

In Durant’s place, Pierre S. du Pont took over GM. This new beginning in 1920 marks the true emergence of the modern GM.\textsuperscript{8} With du Pont in charge and the Du Pont Company’s interests gaining a large percentage of ownership in the company, GM received over $100 million in needed funds from the House of Morgan. On May 10, 1923, Alfred P. Sloan was elected president of GM following the resignation of du Pont.\textsuperscript{9} Sloan instituted a much-needed reorganization plan similar to an earlier structure introduced at Du Pont. The plan included a system of decentralization and financial control that was the most influential management innovation of the century in the early 1920s.\textsuperscript{10}

The fundamental concept was analogous to the staff-and-line system of military organizations. It was desirable that the company’s operating divisions should be reasonably free to manage their own affairs, while at the same time there should be adequate central authority to insure smooth coordination and clear definition of the corporation’s overall policies. This was particularly true for new vehicle development as a result of the near disaster experienced in 1921-1922. By 1935, a procedure for governing the production of new models had been documented.\textsuperscript{11}

Sloan acknowledged the comparison of his organizational structure with military structures, but pointed out that in his system the distinction was between the central office and the divisions. This is a more accurate description because the central office at GM
engaged in some line activities. The central office also had the final power of decision on those activities that should be dealt with by the central authority and those by the divisions.

Sloan also envisioned a corporation in which each division was relatively autonomous but also had specific market targets. Chevrolet, for example, was targeted for the low end of the market, while Cadillac, with a reputation for quality dating back to 1904, was marketed for the luxury car segment. The rest of the GM divisions -- Oakland, Oldsmobile, Buick and later Pontiac and La Salle -- filled market gaps in between.

This plan was not only aimed at maximum market coverage and penetration but also corresponded to Sloan's accurate foretelling of changing market conditions. By the 1920s, the American automobile market was beginning to change from one dominated by first-time buyers. Sloan correctly reasoned that for the industry and particularly GM to continue to prosper, ways had to be found to stimulate the replacement market. Sloan's organizational plan represented one method because it instituted a clear class structure to GM's automobile lines. This class structure was upwardly mobile, meaning that a buyer could theoretically purchase additional stature by moving from a Chevrolet to a Pontiac and from that line to a more expensive car. Sloan's new approach would provide "a car for every purse and purpose."^{12}

Sloan institutionalized the concept of an annual model change through which an older car could be identified as such and would therefore become an incentive for buying a new model. But Sloan knew that "planned obsolescence" could not rest on mechanical innovation. In 1927, GM created its Art and Color Section, led by the famed stylist Harley Earl.^{13} Earl helped to create an aesthetic, rather than mechanical, emphasis for the annual model change. Sloan's changes contributed to GM's emergence as the industry leader. In
1926, GM sold over 1.25 million vehicles. In 1927, Chevrolet alone outsold Ford, the number two manufacturer.\textsuperscript{14}

During the decades following World War II, the demand for cars was so strong that mechanical innovation played very little part in the industry. As a result, the "numbers-oriented executives," who were the financial men leading GM, were successful in generating high profits by merely increasing production. Research, quality, and technology all were deemed less important than the bottom line. Had the world remained the same, this approach might have reaped nothing but benefits. But, the world changed. In the 1960s, inflation and higher labor costs drove the price of cars higher, and some lower-cost imports -- notably the Volkswagen Beetle -- began to make large inroads in the American market. GM and the other American manufacturers, except American Motors, did not aggressively fight the foreign manufacturers.

The Arab oil embargo of 1973-1974 and the price shock of 1979 fundamentally altered the automobile market. Smaller cars, which GM and other manufacturers had rejected as being unpopular with the big-car-fixated public, became best sellers because of their lower price and high mileage ratings. This change in the domestic market also corresponded with the rapid industrialization of much of the rest of the world. The effect on American manufacturers, including GM, can be seen in the fact that American manufacturers held 76.2\% of the world market in 1950; by 1982, that number was only 19.3\%.\textsuperscript{15}

The 1979 oil price shock exacerbated the problems faced by the American automobile industry. The economic dislocation of the price rise, quickly followed by the 1982 recession, shook GM to its foundations. Far from controlling 50\% of the domestic
market as it had in the 1950s, GM was faced with accepting a 35% share of the market as its upper limit. Entering the late 1980s, GM had yet to formulate an entire line of cars that were seriously competitive with Japanese or Europeans cars and even with the rebounding Ford and Chrysler. Net loses for 1980 were $762.5 million -- GM's first losing year since the 1920 du Pont-Sloan takeover.\textsuperscript{16} Roger B. Smith, GM's Chairman and Chief Executive Officer since January 1, 1981, began the process of developing cars and an organization that would return GM to its accustomed place of industry leadership.\textsuperscript{17} Smith believed that GM's products and production processes belonged to a bygone era.

Smith's first priority was restoring profitability. Fixed expenditures were reduced by nearly $3 billion and another $3 billion pared from operating expenses. More than $1 billion was raised through the sale of non-earning assets. All these moves resulted in record profits of over $3.7 billion in 1983 and $4.5 billion in 1984.

In January 1984, the most extensive organizational change in GM history was announced.\textsuperscript{18} GM's North American operations were restructured into two car groups. One car group included Chevrolet, Pontiac, and GM of Canada, and was named CPC. The other included Buick, Oldsmobile, and Cadillac and was named BOC. Each group had complete responsibility for engineering, manufacturing, assembly and marketing its products. Previously in 1981, GM had consolidated its worldwide truck and bus engineering and its assembly operations into the corporate Worldwide Truck and Bus Group. The Body and Assembly Group, which consisted of Fisher Body, General Motors Assembly Division (GMAD) and Guide, was phased out. The body engineering and assembly responsibilities were integrated into the two new car groups.
GM began making a dramatic bid to regain market shares and leadership in design with its 1987 models. In 1988 on sales and revenues of $110.2 billion, GM earned a record net income of $4.9 billion. In the face of a 6% decline in automobile industry sales volumes in the U.S., GM sales and revenues in 1989 increased to a record $126.9 billion and earnings were the third-highest in GM’s 81-year history, despite a difficult sales environment.¹⁹

As GM moved into the 1990s, it was apparent that economic uncertainties, competitive pressures, intense global competition, stringent fuel economy standards, tougher emission standards, and a pace of change more challenging than ever would affect all automobile manufacturers. In 1991, the American automotive industry sustained losses unparalleled in its history. The challenges facing GM were particularly acute in the primary North American automotive market. GM accelerated fundamental changes in the way it did business.

The year 1992 was known as the year of management changes at GM. On November 2, 1992, John (Jack) F. Smith, Jr. was appointed President and CEO of GM, succeeding Robert Stemple who retired at the request of the GM Board of Directors.²⁰ Smith led a turnaround of GM over the next five years and in the process realigned the corporation into five business sectors. These sectors were:

1) North American Operations Automotive (NAO);
2) International Automotive (IO);
3) Finance/Insurance;
4) Automotive Components Group Worldwide (ACGW – now Delphi Automotive Systems); and,
5) Electronic Data Systems (EDS) and Hughes-Electronics (GMHE).

Each business sector formed a Strategy Board of governance comprised of top functional management for that sector. A Global Strategy Board, chaired by Smith, was formed to oversee complete corporate activities. The CPC and BOC Groups were eliminated and NAO became responsible for the design, build, and marketing of all passenger cars and trucks in the North American market. Since that time, additional realignments and divestitures have resulted in the corporate organization structure shown in Figure 1.1.
Figure 1.1 General Motors Organizational Structure
Prior to 1984, GM’s organizational structure still reflected what had been established by Sloan in the early 1920s. Every car produced by GM was the responsibility of a segmented car division such as Chevrolet, Pontiac, Oldsmobile, Buick, or Cadillac. Originally, these divisions were responsible for designing, building, and marketing their own cars. In 1965, the creation of the General Motors Assembly Division (GMAD) and the standardization of car bodies produced by the Fisher Body Division, altered these roles. Fisher Body was responsible for the design and build of all car bodies for all car divisions and GMAD assembled the vehicles. MaryAnn Keller, a journalist, described this arrangement this way: "General Motors did not operate as one cohesive corporation but, rather, as seven separate and distinct operations."21

Rapid decision making and implementation were difficult within and among these divisions due to the tiered responsibility for the creation of new models. Obtaining agreement from three separate organizations in the process of designing and producing a new vehicle was difficult at best. This arrangement originated during the time when cars were designed to have a body (Fisher Body) placed on a full chassis (Car Division) at an assembly plant (GMAD).

The advent of smaller cars, often with front-wheel drive, caused a shift to unibody construction. In unibody construction, the body replaces the chassis as the structural base of the car. All subassemblies attach to the body rather than to the chassis. By attaching subassemblies to the body, greater coordination is required between the body and most of
the other components. But greater coordination was difficult because there were multiple divisions involved in the process.

Functional Teams in the Vehicle Development Process

Vehicles developed during this time were guided under the direction of a general manager of the respective car division. No formal method of program management existed. Wheelwright and Clark describe this organizational structure for product development as a functional team.\textsuperscript{22} Functional teams, as their name suggests, are organized by functions, with each team or subteam working under the direction of a specialized functional manager. Figure 1.2 shows the functional team organization.

The work of these functions is planned in advance through detailed specifications combined with occasional meetings to resolve issues that cut across disciplines. Each function owns the work processes it uses and applies them in a fairly uniform fashion independent of the specific project and its nature. Responsibility for project work shifts over time from one function to the next according to prior agreements on project control. This procedure does not always run smoothly or quickly, especially for complex projects or products.

Over time, internal cultures developed and employees identified with their particular organization. This identification was visible in many ways. Divisions had their own symbols that were proudly displayed on many personal or office items. Employees who were assigned company cars drove only their car division’s products. Many other employees purchased only cars made by their division.\textsuperscript{23}
Figure 1.2 Functional Team Organizational Structure
It was common for employees to spend their working careers within one division. Long-term relationships led to tight communication networks that helped get work done within the divisions. Little interface between the car divisions was required. The cultures of the car divisions remained unique and largely unblended. The divisional focus developed work methods and procedures that were unique both formally and informally.\textsuperscript{24}

**Lightweight Teams in the Vehicle Development Process**

In the late 1970s, project centers for new vehicle development were established. A project center would be responsible for the design of multiple car lines that shared a common platform. A program manager directed each project center. Employees representing the various divisions involved in the vehicle program reported to the program manager. These people served as a liaison between their divisions and the project center, with the majority of the work still being completed at the respective division.

Wheelwright and Clark describe this organizational structure as a lightweight team, which is characterized by functional representatives or liaisons that comprise a committee that is coordinated by a lightweight project manager.\textsuperscript{25} Figure 1.3 depicts this organizational structure.

The project manager schedules, encourages, and tracks the project's various activities. The basic work and most of the decision making take place back in the functions. The functional representatives remain part of their disciplines, with the liaison role added to their regular responsibilities. The lightweight project manager is generally
Figure 1.3 Lightweight Project Team Organizational Structure
someone who has expertise in his or her function, but no status or influence. This implies the manager’s lack of control over resources, which remains the responsibility of the functional areas. While lightweight project managers coordinate project activities and keep the relevant functions apprised of the work, they could neither reallocate resources nor reassign people within the project.

Typically, these managers spend a small percentage of their time managing the project and describe their key activities in terms of reminding, encouraging, persuading and pleading. These activities occur with the liaisons of the various functional areas where the lightweight project manager finds his or her only opportunity for strong program management influence. "The car division-Fisher Body-GMAD set up was cumbersome, costly and too slow to be competitive," according to F. James MacDonald, Executive Vice President of Group Operations in 1983.²⁶

Consequently, this led to the major reorganization into two car groups in 1984. As the new organization began to operate in 1985, the power of the car divisions influenced the nature of the new operating groups. The dominant former divisions influenced placement of employees in new positions, operating policies, and beliefs and values. In many ways, operations resembled a corporate acquisition. Informal networks broke down and were slow to redevelop in the new organizations.²⁷

**Autonomous (Heavyweight) Teams in the Vehicle Development Process**

The BOC Group continued to use a form of the lightweight project manager to oversee vehicle development. The CPC Group experienced a number of organizational structures that ranged from the lightweight project manager to an autonomous team.
Autonomous teams, or "tiger teams", are heavyweight teams whose members have been pulled out of their functions and transferred to the project, as described by Wheelwright and Clark. Figure 1.4 shows the organizational structure for an autonomous team.

In their pure form, team members are co-located and self-contained. Leading the team is a heavyweight project leader who has full control over resources and exclusively evaluates team members' individual performance. The team and its leader have great latitude as to the decisions they make, the processes they use, and the sources from which they seek support and assistance -- which are usually outside the organization.

Through the remainder of the 1980s and early 1990s, organizational changes were tempered by the experiences of the major changes of 1984. Name changes and high-level reporting relationships were revised, but major working-level alterations were kept to a minimum. Separation of the customer contact experts in the marketing and sales organizations from the development process resulted in slower-than-desired product decisions. Product styling remained organizationally separated from the BOC and CPC Groups' product development activities.

The collapse of the automobile market in North America made the deficiencies in the corporation apparent. According to Keller, "If a car company, large or small, wants to survive, it has to know who it is and who its customers are."
Figure 1.4 Autonomous Team Organizational Structure
A MANDATE FOR CHANGE

The management changes that occurred in 1992 and the realignment into the five business sectors also signaled a revision to the vehicle development process at GM. The most urgent challenge was to reverse the financial losses in NAO. A.T. Kearney (a consulting company) was contracted to conduct a shallow-dive on the vehicle development process. They reported that the lack of an effective program management system for vehicle development and the inconsistent use of the GM Four Phase Vehicle Development Process (4ØVDP) were the most notable problems. These issues resulted in vehicle programs that were long in development time, with high development costs and not responsive to the market. A.T. Kearney recommended that for GM to survive and for NAO to become profitable, the vehicle development process needed to be faster and provide differentiated products with improved quality that appealed to the market.

Team 2

Seven principal initiatives were undertaken to improve the operating performance of the vehicle development process. Each initiative was assigned a team that was championed by a senior member of management. The development of a program management system was the responsibility of Team 2, formed in November 1994. This team would determine the most appropriate program management structure for vehicle development. The membership of Team 2 is shown in Figure 1.5.
Team 2 Membership

Don Hackworth      Team Champion
Dave Sharpe        Team Leader
Bram Bluestein     A.T. Kearney
Mike Borugian      A.T. Kearney
Scott Corwin       A.T. Kearney
Bob deKruyff       A.T. Kearney
Darlene Dempsey    A.T. Kearney
Tom Fabus          A.T. Kearney
Dick Huber         A.T. Kearney
Joe Kennedy        A.T. Kearney
Dick Larsen        A.T. Kearney
Barry Michels      A.T. Kearney

Human Resources Subteam

Dick Huber         Subteam Leader
Cheri Alexander    Subteam Leader
Katy Barclay       Subteam Leader
Scott Corwin       A.T. Kearney
Ralph Frederick    A.T. Kearney
Tony Hain          A.T. Kearney
Bob Krause         A.T. Kearney
Dick Larsen        A.T. Kearney
Jenny Machak       A.T. Kearney
Bill Tate          A.T. Kearney

Figure 1.5 Team 2 Membership
Team 2’s initial charter from the NAO Strategy Board (NSB) was to have the new program management system in operation by February 1995. It was also agreed that Team 2’s focus would be on program management for vehicle development only in NAO. At this time, consideration for a global program management system was not addressed. As Team 2 began to formulate its work plan, it was recognized that this timing was too aggressive for the task assigned. This led to a subsequent negotiation with the NSB for implementation of the new system in the fourth quarter of 1995.

Issues

Initially, Team 2 spent considerable time gathering information and learning about different aspects of program management in the vehicle development process. To understand the current structure of program management, Team 2 identified the following issues:

- The current process was complex, cumbersome, and “rework” intensive.
- Program milestones were not sacred and program issues remained unresolved.
- Decisions made were continually being revisited.
- Program reviews within the vehicle development process did not consistently measure design integrity.
- A disproportionate amount (estimated at 50%) of engineering resources and budget were committed to current programs and as a result, deprived new programs of critical resources.
• The vehicle planning process did not adequately recognize capability/skill constraints or process restrictions in critical functions.

• The "competition" among sales/marketing, design and platform organizations to control programs deterred effective execution of vehicle development programs.

Causes

These issues were analyzed to determine their causes. The following root causes were identified:

• Rules and responsibilities for programs were not clear.

• The program manager’s responsibility and authority were limited.

• Program teams were not empowered to make all the necessary tradeoffs during vehicle development.

• There were excessive hand-offs of program leadership among the various functional units.

• The process lacked a management system to prioritize quality, reliability and durability (QRD) activities.

• There was no process to manage critical resources or to resolve process bottlenecks.

Finding Solutions

To address these problems, Team 2 began by acquiring an understanding of the culture within GM and the impact on that culture of decisions made in the vehicle
development process. The Team believed that the interfaces and interactions between the various functional groups in GM would lead to the appropriate program management structure. A number of companies were benchmarked for their program management systems used for product development. These firms included Ford, Chrysler, Toyota, TRW Automotive Systems, and (internally) Hughes Electronics.

As a result of the benchmarking and consultation, Team 2 concluded that a strong, single-point program management system for NAO was essential. In this system, every vehicle would have a champion who translates customer needs into technical specifications of the vehicle. This champion would also keep the program integrated and on track throughout the lifecycle of the vehicle. The champion would have appropriate responsibility, accountability, and resources to manage the program. The champion would be similar to the heavy-weight product manager at Toyota known as a program Shusa with broadened responsibility to include profit and loss.

The Shusa plays the roles of concept creator, concept champion, and coordinator of functional divisions. He/she is also responsible for establishing the requirements, both financial and technical, for the vehicle. The Shusa is a high-level position in Toyota and many Shusas have been functional managers. They have ultimate responsibility and authority to manage the entire development program and to satisfy the required program targets. Their primary responsibility is to resolve conflicts among various functional divisions. The Shusa does not have formal line authority over functional organizations but acts as the promoter of the process and thereby derives his/her power from the process.

GM announced in October 1995 the "evolution of the vehicle development process" known as the Vehicle Line Executive (VLE) system. The goals of this system include
bringing new products to market faster, at high quality, and matching the needs of target customers.\textsuperscript{33} The Vehicle Line Executive system was instituted in January 1996 to perform this task, and a Vehicle Line Executive (VLE) with absolute authority for all program decisions was appointed for each market segment. In total, thirteen VLEs were appointed and each VLE had a small cross-functional team (VLE Team) with responsibility for development of products across organizational lines. The announcement was considered "evolutional," as the divisional structures and functional groups remained unchanged.
NOTES


5. Ibid., p. 234.


7. Ibid.

8. Ibid., p. 177.


14. Ibid.

15. Ibid., p. 179.


17. Ibid.

18. Ibid., p. 422.

19. Internet information on GM (Web site: http://trex.idc.edu:8005/corp/com/history

20. Ibid.


24. Ibid., pp. 117-118.

25. Wheelwright, and Clark, op. cit., p. 83.


27. Ibid., p. 118.

28. Wheelwright and Clark, op. cit., p. 84.


CHAPTER TWO

THE BUSINESS MODEL
STRATEGIC MANAGEMENT FRAMEWORK

The Business Model Strategic Management Framework developed by Hax and Majluf\(^1\) will be used to evaluate the organizational structure for program management of vehicle development at GM. This framework integrates the strategy, structure, business processes, performance, and culture of a company. A company's strategy provides the overall mission of the firm, strategic thrusts, and functional requirements. From this strategy, an organizational structure is created that defines the assignment of critical tasks of the organization to its workforce. In order for the workforce to complete its assignments, a set of business processes allow for a specific ordering of the work activities in the most effective manner. As with all processes, the performance of the organization and its processes are monitored using relevant and contemporary measures based on control and motivational systems. These measures determine the culture, which establishes the set of values and beliefs of the firm and defines the rules of the organization's individual behavior. This framework is depicted in Figure 2.1.

This strategic framework follows the highly influential strategy/structure thesis that was developed by Alfred Chandler.\(^2\) Chandler's work grew out of his fascination with the rapid spread of new strategies formulated by companies in the 1950s and 1960s and the organizations needed to manage them. The modern term for these integrating capabilities
is organizational architecture. This architecture includes the formal structure, the design of work practices, the nature of the informal organization or operating style, and the process of selection, socialization, and development of people.
Figure 2.1 Business Model Strategic Management Framework
NOTES


CHAPTER THREE

THE STRATEGY OF GENERAL MOTORS

VISION OF THE FIRM

Application of the framework for analyzing the organizational structure of program management in vehicle development at GM begins by evaluating the strategy of the corporation.

General Motor's vision is stated as:

World leader in transportation products and services. We are committed to providing total customer enthusiasm through people, teamwork, technology, and continuous improvement.1

Customer enthusiasm can only be achieved by offering highly differentiated, quality products that are affordable. This requires GM to respond more quickly than ever to changing technological and market opportunities by introducing more new products, offering broader product lines, and upgrading products more rapidly. This ability to respond is an emerging pattern of competition, which requires automotive companies to show significant flexibility. Firms that achieve superior flexibility in product creation can destabilize other firms that try to adhere to more traditional product strategies of low cost, differentiation, or focus.
CORPORATE STRATEGY

To achieve this vision of world leadership in transportation products and services, four priorities have been defined within the GM corporate strategy:

- "Run Common"
- "Think Lean and Run Fast"
- "Compete on a Global Basis"
- "Grow All Business Sectors."

"Run Common"

By running common, GM focuses on the use of common processes, systems, and components across the corporation. In manufacturing, for example, the use of common processes for vehicle assembly provides flexibility to respond to market changes. With this flexibility, vehicle production can be moved from one facility to another or adjusted for product mix without significant delays for plant conversion. Process flexibility increases the rate and cost efficiency of capacity utilization in the manufacture of a given set of products.\(^2\) This type of flexibility contrasts with a common system for payroll processing that can yield tremendous savings through economies of scale.

Common components that are not recognized by the customer as differentiating factors can be used, thereby reducing valuable lead times and structural costs in product development. This design methodology, known as modular product design, has been used in industries as diverse as computer hardware, software, photocopiersones, consumer electronics, household appliances, and power tools. This approach was used by Sony to minimize its
design cost for the Walkman. Sony carefully controlled the costs of new models by building all of its models around key modules and platforms. Modular design and flexible manufacturing allowed Sony to produce a wide variety of Walkman models with high quality and low cost.\textsuperscript{3}

Modular product design methodology typically decomposes the product into a hierarchical system of functional components that are interrelated through specified interfaces. These interfaces define the physical and functional characteristics of each component. The specified component interfaces in a product design define a product architecture.\textsuperscript{4} Deviations from common are only justified where differentiation is required to satisfy unique customer needs. The emphasis on common allows more efficiency, flexibility, and speed to market. Running common across the corporation permits learning from individual experiences that enhance technology exchange for product and process improvements.\textsuperscript{5}

"Think Lean and Run Fast"

This applies to internal operations, suppliers, and dealers. This is crucial for cutting fixed costs, reducing material costs, shortening product development cycles, and gaining efficiencies in manufacturing and distribution. By eliminating unnecessary activities, GM can concentrate on maximizing value-added operations and functions. A lean, fast organization is more nimble in response to a changing environment.\textsuperscript{6}
"Compete on a Global Basis"

From a product perspective, this priority includes the development of global vehicle brands, vehicle platforms, and powertrains. Special emphasis is placed on the development of global small car platforms that are adaptable, affordable, and profitable. From a market perspective, this means aggressive expansion in emerging markets beyond North America and Western Europe.

"Grow All Business Sectors"

In addition to the geographical expansion in emerging markets, this priority focuses on identifying new market segments and new businesses at the downstream end of the vehicle purchase and ownership cycle.

Together, these four priorities combine to form a focus at GM on customer enthusiasm.

THE BUSINESS MISSION FOR NAO

From the corporate strategy of GM, the business mission for NAO is derived. It parallels the corporate vision, and the elements of the proposed strategy that will achieve this mission are embodied in the GM-NAO Plan-To-Win shown in Figure 3.1.
Common Processes and Systems
Leverage Global Resources

Employee Enthusiasm

Vehicle Development
"Factory"
Level the System
"Timing is Sacred"
Lean, Flexible Operations
Worldwide Purchasing Process

Differentiated Brands
Optimize GM
Strong Distribution Channels

Shareholder Enthusiasm

Customer Enthusiasm

Fast To Market, Targeted Products
Competitive Cost & Quality

Feedback

Figure 3.1 GM-NAO Plan-To-Win
Again, customer enthusiasm is at the heart of this strategy. The belief is that customer enthusiasm will drive demand for products and, as a result, this demand will provide sustainable profits for the corporation and its shareholders.

There are seven strategic thrusts aimed at creating customer enthusiasm:

1) Each vehicle must be a differentiated brand, targeted to a specific set of customer needs.

2) These vehicles will be sold through strong distribution channels represented by more than 7,500 GM dealers.

3) Lean, flexible manufacturing operations will be used to produce these vehicles efficiently.

4) A worldwide purchasing process will be used to secure the lowest possible material cost.

5) New vehicles will be created in a vehicle development "factory" that includes a portfolio planning process, the aforementioned VLE system for program management, and a common process for vehicle development.

6) The workload through the engineering "factory" will be leveled with multiple new vehicle introductions scheduled throughout the year.

7) Timing is sacred in maintaining the level workload in the engineering "factory" and to guaranteeing new products on a regular basis for the marketplace.

The principal force running through these seven strategic thrusts is employee enthusiasm, which will be driven by feedback from management, customers, and shareholders.
Complementing the seven strategic thrusts are four other initiatives also aimed at achieving customer enthusiasm:

1) The use of common processes and systems in every aspect of NAO’s business to gain economies of scale, eliminate duplication, promote technology exchange and reduce fixed costs.

2) Leveraging of global GM resources to create global products capable of being produced anywhere in the world.

3) Fast to market with targeted products, focusing on quick responses to changes in the marketplace with products designed for the specific needs of the customer.

4) Competitive cost and quality for all products.
NOTES


The organizational structure for program management of vehicle development comes directly from the business strategy of NAO. The need to generate customer enthusiasm with highly differentiated quality products that are affordable dictates that the organization must be close to the customer, yet efficient in creating and manufacturing vehicles. As a result of benchmarking and consultation, Team 2 concluded that a strong, single-point program management system, in conjunction with a multi-functional team for vehicle development, was essential.

A recent survey of twenty different factors judged to be potentially important in affecting movement of new products to market, identified multi-functional teams and strong program managers as having the highest overall statistical impact.¹

The Vehicle Line Executive system was instituted to perform this task and a Vehicle Line Executive (VLE) with absolute authority for all program decisions was appointed for each market segment. Each VLE had a small multi-functional team (VLE Team) responsible for the development of products across organizational lines.

This organizational structure leads to what Wheelwright and Clark describe as the heavyweight program manager team.² The organization structure of a heavyweight program manager team is shown in Figure 4.1.
The heavyweight team gives the program manager responsibility for the total project effort and its overall success. The VLE effectively serves as the general manager of the program in an organization, which is still largely functional. This includes integrating functions and bringing the "voice" of the customer into the process. The VLE or heavyweight program manager is often quite senior in the organization and brings both expertise and organizational clout to the project. The heavyweight team itself consists of a core group of functional leaders responsible for work on the project and the majority of project decisions in their functions. While much of the work is performed in the functional groups, it is directed or influenced by the heavyweight team and its leader. The organizational structure of the VLE Team is shown in Figure 4.2.

The structure of the VLE team is analogous to a matrix organization. Matrix organizations evolved in the 1960s when the U.S. government required defense contractors to adopt a project management system. This system was intended to allow representatives of government agencies to have a single source of contact with a defense contractor across the contractor's functional organization. The defense contractor's project manager had full responsibility for meeting costs and deadlines over the entire project.

Increasing complexity of certain industries (e.g., aerospace) facilitated the continuing evolution of matrix organizations, especially in the 1970s and 1980s. These matrix organizations provided a more flexible system of direct contacts in companies by replacing the formal bureaucratic structure. A disadvantage of the matrix organization was the overwhelming information processing requirements. Today, companies in many industries
Figure 4.2 VLE Team Organizational Structure
continue to use different forms of matrix structure that are typically driven by rationalizing specialized technical resources.

There are many advantages of a multi-functional matrix organization. Matrix organizations:

- Create lateral communication channels that are not available in traditional, hierarchical organizations.
- Reduce the need for vertical communication by creating self-contained task teams focused on a specific, finite project.
- Improve the communications among different departments by forcing managers to maintain close contact with all organizational groups critical for the project’s success.
- Require managers to develop superior communication skills to keep the support of resource providers and to ensure resource availability.
- Are able to handle increased loads of information.
- Have resources that can be more quickly and easily transferred.
- Can positively influence motivation, job satisfaction, commitment and personal development.
- Enlarge an individual’s outlook, increase responsibility and involvement in decision-making and offer greater opportunity to display capabilities and skills.
- Facilitate high quality and innovative solutions to complex technical problems.
• Benefit projects from the use of functional economies of scale while remaining small and task oriented to stay technically innovative.

Matrix organizations also have some disadvantages to their organizational structure.

Matrix organizations:
• Violate the principle that authority should equal responsibility and the principle that every subordinate should be assigned to a single boss.
• Have multiple boundaries of authority and responsibility that create ambiguity and conflict over resources, project priorities, administrative procedures, technical perfection vs. performance tradeoffs, personnel resources, costs and scheduling.
• Cause functional managers to view the matrix as a loss of status, authority and control over their traditional domain.
• Can be costly due to the need for additional management and administration, increased meetings, increased information processing, training, monitoring/controlling/coordinating people and projects in the matrix.
• Can create conflict that exists at the individual level due to different work orientations, time horizons, values, multiple reporting relationships, role ambiguity, conflicting and confusing expectations and excessive demands.

Matrix organizations contain some very interesting paradoxes. It is important to determine which advantages are really advantages and which disadvantages are really disadvantages. Increased information processing capacity is an advantage, but its cost is a disadvantage. Lateral communication channels increase communications frequency, yet create greater ambiguity over resources and conflict between functional and project
managers. Increased motivation and job satisfaction is an advantage, but greater potential conflict among individuals might be viewed as detrimental. The challenge is to maximize the advantages and minimize the disadvantages. The key success factor to matrix organizations is a shared power system dependent upon a strong leader to arbitrate between power sharing subordinates and peers.

Matrix organizations can be plagued with common problems. A matrix can develop tendencies toward anarchy. Anarchy results from a formless state of confusion where people do not recognize a "boss" to whom they feel responsible. Relationships between functional and product managers need to be explicit so agreement exists about who is to do what under various circumstances to avoid this confusion. Clarity of roles, authority and responsibility between project and functional managers is critical. A matrix can foster power struggles because managers jockey for power more so in matrix organizations. This is inevitable due to the overlapping boundaries of authority and responsibility thereby, requiring clear delineation in decision making. Decision making can be a problem in itself as a result of severe "groupitis."

Managers can mistakenly believe that in a matrix all decisions need to be made by a group consensus. It is critical that decisions need to be left to those most informed. Finally and most importantly, the culture of a company must be adjusted to accept continuous conflict as a way of life recognizing the significant tension a matrix organization instills. These problems highlight the need to understand the interfaces and decision making of the VLE Team.

Each of the four types of organizational structures for product development teams has strengths and weaknesses. Figure 4.3 compares these strengths and weaknesses, including those of the heavyweight program manager team.
<table>
<thead>
<tr>
<th>Team Type</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>Optimal use of resources, expertise, depth, scale economies; control and accountability; career path congruence</td>
<td>Lack of breadth; rigid, bureaucratic; task, not project-oriented; slow, disjointed; turf/expertise-driven</td>
</tr>
<tr>
<td>Lightweight</td>
<td>Improved communication and coordination; less idle time between tasks</td>
<td>Weak project leader and project focus; frustrating to individuals</td>
</tr>
<tr>
<td>Autonomous</td>
<td>Focus on results; owns business objectives; innovative</td>
<td>Independent/not integrated with rest of organization; autonomy is core value</td>
</tr>
<tr>
<td>Heavyweight</td>
<td>Strong project focus, commitment and accountability; integrated system solution</td>
<td>Hard to staff; requires breadth; must break down functional barriers</td>
</tr>
</tbody>
</table>

**Figure 4.3 Comparison of Organizational Structures for Product Development**
INTERFACES OF VLE TEAM MEMBERS

The operating principles of the VLE Team members came from understanding the interfaces and interactions that were required to make program management work between the various functional groups. This was accomplished by creating interface charts between every functional area and the VLE. The total focus was in determining a desired description of the interface, deliverables and decisions produced at the interface and implications resulting from the interface. The intent was understanding this interface relationship and not the specific work performed.

These interfaces were developed and documented by Team 2 during the development of the VLE system. Team 2 discovered that the development of these interface documents could not be done without the support of the other original six teams that had been assigned with the responsibility of overhauling the vehicle development process at GM. Requests for supporting information were given daily to the other six teams. In return, the other six teams found that they required similar information from Team 2. Through monitoring the daily requests, it is estimated that of the total requests for information, Team 2 initiated 75% of them.

Each member of the VLE Team maintains a dual reporting relationship to the VLE and their functional staff director. There are three primary interfaces as a result of this relationship:

1) between the team member and the VLE;

2) between the team member and their functional staff director; and,

3) between the VLE and the functional staff director.
Each interface had been documented earlier during the development of the team structure with descriptions for deliverables and decisions produced at the interface, the desired interface and implications of the interface. The interface descriptions for the Vehicle Chief Engineer are shown in Figures 4.4(a), (b), and (c).

DECISION MAKING IN THE VLE SYSTEM

It is recognized that many key sequential and continuous decisions will be made at each organizational interface. The key output of the VLE Team is decisions regarding vehicle programs. It was also recognized that the role of VLE Team members and functional area managers for decision making would be different around different decisions. Since ambiguity around decision making in a matrix organization is a common problem, it was decided to clearly define who had the decision making authority over which issues.

Responsibility charting, or RASIC, was the process used to document the decision-making authority at each of the VLE Team and functional area interfaces. Responsibility charting is a mechanism for reducing the ambiguity and conflict that can be produced by complex organizations. It does so by facilitating the clear differentiation of roles and responsibilities between people who must work together to achieve organizational goals.

Responsibility charting begins with identifying the key decisions to be made. These are critical decisions that involve the participation of several different decision-makers. Since the purpose is to reduce interface ambiguity and conflict, simple decisions that are
★ Deliverables/Decisions produced at the interface
- Define Vehicle Technical Specifications (VTS)
- Define Manufacturing Technical Specifications (MTS)
- Jointly develop an achievable contract (Team activity)
- Agree on some technical trade-offs
  ➢ Less than contract threatening
  ➢ More than day-to-day engineering decisions
- Determining timing of innovations

★ Description of desired interface
- Seamless an interdependent relationship
  ➢ Shared vision
  ➢ Mutual respect for each other's knowledge and capabilities
  ➢ Supportive of each other's contributions to program's development
- Close working partnership

★ Implications
- Vehicle Chief Engineer leads development of VTS and MTS
- Vehicle Chief Engineer is primary liaison with functional engineering organization

Figure 4.4(a) Vehicle Chief Engineer Interface Description
Vehicle Chief Engineer to Vehicle Line Executive
★ Deliverables/Decisions produced at the interface
  - Define Subsystem Technical Specifications (SSTS) which satisfies VTS and MTS

★ Description of desired interface
  - Close working relationship between Group Engineering Director and Vehicle Chief Engineer
  - Professional respectful
  - Partnership based

★ Implications
  - Vehicle Chief Engineer is responsible for integration of vehicle level specifications and high order subsystem specifications
  - Lower order subsystem specifications are the responsibility of the functional engineering organization
  - Direct reports to Group Engineering Director manage lower-order SSTS and MSTS issues
  - Vehicle Chief Engineer is integral part of Group Engineering management

Figure 4.4(b) Vehicle Chief Engineer Interface Description
Vehicle Chief Engineer to Group Director Engineering
★ Deliverables/Decisions produced at the interface
  - Ensure engineering capability to achieve contract
    ➤ Both sign contract
  - Conflict resolution between program and function
  - Mutual agreement on appointment of Vehicle Chief Engineer
  - Balancing innovation in program
    ➤ Supply driven by function
    ➤ Demand driven from program
  - Share/exchange information
  - Monitoring of functional organization's performance and program's progress
  - Deviations from common processes
  - Annual resource planning

★ Description of desired interface
  - Interdependent relationship which results in meeting or exceeding the contract
  - Does not include day-to-day issues

★ Implications
  - Common goal is program's success in meeting the charter
  - Group Engineering Director is engineering "factory" manager
  - Group Engineering Director is responsible for supply driven innovation
  - VLE through the Vehicle Chief Engineer is responsible for demand driven innovation

Figure 4.4(c) Vehicle Chief Engineer Interface Description
Group Director Engineering to Vehicle Line Executive
extremely clear are not considered crucial. The decisions are designated a decision type.

There are three decision types:

1) a decision made at the interface between two people,

2) a decision made by the VLE Team and,

3) a decision make by an individual.

It is important to list all the participants in the decision-making process.

A chart listing all the decision makers on one side and all the decisions on the other creates a matrix for defining the role of those involved in the decision. A person who is responsible for setting direction and initiating action to ensure that the decision is made is assigned "R" for responsibility. A person who has the right to sanction, veto or alter a decision and must approve a decision before it is implemented is assigned an "A" for approval. A person who provides data, resources, expertise or facilities needed to make a decision is assigned an "S" for support. This person provides support and participates in the decision-making process before the decision is made.

A person who is not generally involved in the decision-making process, but must be consulted prior to making a decision is assigned a "C" for consult.

The person having the "R" for the decision has the responsibility to initiate consultation, but is not bound by "C"'s feedback. A person who needs to be informed after the decision is made is assigned an "I" for inform. This person needs this information to perform their work. The person having the "R" for the decision has the responsibility to communicate to this person.

Guidelines for the use of responsibility charting have been determined. There is only one combination role allowed in the decision making. The combination "R/A" indicates a
person who makes and then implements the decision without review or approval by others. There can only be one "R" per decision.

In situations where agreement cannot be reached, there are three options for assigning the "R". The first option is to try and break the decision into its components to see if there are multiple decisions. This is always the most desirable alternative. The second option is to move the "R" up one level in the organizational hierarchy. The third option is to elevate the decision about assigning the "R" up one level in the organization. When a decision is to be made at an interface, it will be designated by an "N" indicating its decision type. For these types of decisions, the "R" indicates responsibility to initiate the interface meeting and the "A" indicates the decision makers.

Finally, when a decision is a VLE Team output, it will be designated by "T" indicating its decision type. For these types of decisions, the "R" indicates responsibility to bring the issue to the VLE Team. It is assumed that if the VLE Team cannot reach a decision, then the "R/A" reverts to the VLE.

Figures 4.5(a) and (b) show two decision Responsible, Approve, Support and Inform Charts (RASIC) that identify the functional and VLE Team roles for engineering decisions that could affect a vehicle program. Similar interface descriptions and decision RASICs exist for each VLE Team member.
<table>
<thead>
<tr>
<th>Decision Type</th>
<th>Functional Roles</th>
<th>Key Program Development Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decision Type</td>
<td>Group Engineering Director</td>
</tr>
<tr>
<td>Select Vehicle Chief Engineer</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Develop Technical Expertise</td>
<td>R/A</td>
<td>I</td>
</tr>
<tr>
<td>Assign Resources to Program</td>
<td>T</td>
<td>A</td>
</tr>
<tr>
<td>Develop Achievable Contract</td>
<td>S</td>
<td>A</td>
</tr>
<tr>
<td>Develop Achievable VTS</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Develop High-Order SSTS</td>
<td>R/A</td>
<td>I</td>
</tr>
<tr>
<td>Develop Remaining SSTS</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Integrate VTS and SSTS</td>
<td>R/A</td>
<td>I</td>
</tr>
<tr>
<td>Determine Balance of Innovation</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Four Phase VDP - Engineering SOW</td>
<td>S</td>
<td>I</td>
</tr>
</tbody>
</table>

R=Responsible     A=Approve     S=Support     I=Informed

Figure 4.5(a) Engineering Responsibility Chart for Decision Making
<table>
<thead>
<tr>
<th>Decision Type</th>
<th>Functional Roles</th>
<th>Key Program Development Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group Engineering Director</td>
<td>Executive In Charge - VLE System</td>
</tr>
<tr>
<td>Key Decisions - Continuous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify Resource Conflicts</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Resolve Resource Conflicts</td>
<td>N</td>
<td>R/A*</td>
</tr>
<tr>
<td>Resolve Technical Trade-offs</td>
<td>N</td>
<td>R/A</td>
</tr>
<tr>
<td>Identify &amp; Resolve Common Process Limitations</td>
<td>N</td>
<td>R/A</td>
</tr>
<tr>
<td>Development of Annual Engineering Resource Plan</td>
<td>N</td>
<td>R</td>
</tr>
<tr>
<td>Engineering Budget Development</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Engineering Budget Trade-offs</td>
<td>N</td>
<td>S</td>
</tr>
<tr>
<td>Assures Technical Brand Character</td>
<td>A</td>
<td>R/A</td>
</tr>
<tr>
<td>Appraisal/Merit of Vehicle Chief Engineer</td>
<td>A</td>
<td>R/A</td>
</tr>
<tr>
<td>Career Planning of Vehicle Chief Engineer</td>
<td>A</td>
<td>R/A</td>
</tr>
</tbody>
</table>

R=Responsible  A=Approve  S=Support  I=Informed  *=Tie Breaker

**Figure 4.5(b) Engineering Responsibility Chart for Decision Making**
Responsibilities of the VLE and VLE Team

In NAO, the VLE and VLE Team integrate and lead the vehicle development process. This integration occurs between the GM sales/marketing division, the GM Design Center and the GM vehicle group responsible for engineering and manufacturing the vehicle.

The deliverables and decisions of the VLE Team include:

- Tradeoff decisions during the vehicle development process,
- Identification, analysis and resolution of issues,
- Cross-functional coordination,
- Achieving a deep understanding of the target market segment,
- Communicating the product vision and customer “voice” uniformly to the functional organizations,
- Developing the vehicle program contract based on a vehicle charter and recommending modifications to the charter as required (this will be discussed later in The Processes section of the thesis),
- Negotiating the vehicle program contract with the NAO Strategy Board,
- Leading the execution of the vehicle program contract consistent with the GM vehicle development process,
- Participating in and supporting the product launch.

In addition to leading the VLE Team, the responsibilities of the VLE include providing focused, single-point decision making and having cradle-to-grave responsibility through a minimum of two product lifecycles.
The VLE Team is intended to have a "seamless" team process with common goals and focus. The decision making should optimize activities at a vehicle program level balanced against the goals of the entire GM organization. Team members should have complementary skills to one another and be matched to the requirements of the vehicle program. The desired team behavior is one of mutual respect and accountability as a team. The VLE Team is physically co-located and team member turnover is managed with the consent of the VLE.

NAO PASSENGER CAR GROUP ORGANIZATIONAL STRUCTURE

For the NAO Passenger Car Group (refer back to Figure 1.1), there are nine VLEs. A VLE is responsible for several vehicle lines in a market segment. Figure 4.6 shows the vehicle lines in the high-mid market segment. These vehicles are characterized as high volume, midsize cars. The customer needs of this market segment are distinct from other segments. The nine VLEs and the functional directors of the vehicle group report to the NAO Passenger Car Group Executive who is also a member of the NAO Strategy Board. The organizational structure of the NAO Passenger Car Group can be categorized as a Front-End/Back-End Structure. The VLE Teams represent the front-end activities that are organized by market segment and are close to the customer and the functional directors are the back-end activities organized by area required to design and build vehicles. Figure 4.7 shows this organization structure.
Figure 4.6 Market Segments by Vehicle Line Executive

North American Passenger Car Market

VLE Large Cars
VLE Luxury Cars

VLE Performance Cars
VLE Midsize Cars

VLE Prestige Cars
VLE Compact Cars

VLE Small Cars
VLE Passenger Vans
VLE Hi-Mid Cars

Chevrolet Lumina
Chevrolet Monte Carlo
Buick Century
Buick Regal
Figure 4.7 NAO Passenger Car Group Organizational Structure
This organizational structure supports the business strategy of NAO. The VLEs are close to the customer and are able to target customer enthusiasm through the development of the proper vehicles. The functional areas are centralized to benefit from economies of scale and technology transfer in producing these vehicles. This centralization especially facilitates the corporate strategic priority to "Run Common."
NOTES


CHAPTER FIVE

PROCESSES FOR VEHICLE DEVELOPMENT

The framework now considers the business processes required by the organization to perform its responsibilities. Business within NAO is conducted using common business processes which are consistent with the corporate priority to "Run Common." The objective is to maximize return on process improvement investment while preserving innovative capability.

There are three main benefits gained from the use of common processes. First, capability-based benefits come from the rapid deployment of lessons learned. The belief is that numerous cycles of learning can become a competitive advantage for GM. Results from the processes need to be measurable, repeatable and predictable. Second, reduced costs will be achieved by leveraging the advantages of NAO’s size rather than remaining uncompetitive due to its complexity. The focus is to arrive at an improved, common process quickly and then continuously improve the common process. Third, common processes provide employee empowerment through individually assigned ownership responsibility for each common process – employees operating common processes and employees working as a team to continuously improve the common process. These common processes form a "basket weave" through the organization between the process owners and process users.
THE VEHICLE DEVELOPMENT PROCESS

The Vehicle Development Process (VDP) is the common process of the vehicle development "factory" strategic thrust mentioned earlier in the NAO Plan-To-Win. There are three components in the VDP (Figure 5.1): VLE Team, Portfolio Plan, and Four Phase Vehicle Development Process.

Component #1: VLE Team

The organizational structure and role of the VLE Team were described in the previous section. However, it is significant to note that a Process Guardian was appointed for the VLE System. The role of a Process Guardian was discovered during the benchmarking of TRW Automotive Systems. In NAO, the Process Guardian is a high-level executive in charge of the VLE System who reports directly to the President of NAO. This Process Guardian is responsible for keeping the organizational learning of the VLE System active and for initiating process changes when required. As a result, the Process Guardian maintains only minimum direct reports, which do not include any of the VLEs. The Process Guardian facilitates monthly forums with the VLEs to encourage learning from each other's experiences. These learning forums also facilitate the identification of other NAO processes that are not working. Periodically, the Process Guardian will update the NSB regarding the latest status of the VLE System and its interaction in the Vehicle Development Process.
Figure 5.1 GM-NAO Vehicle Development Process
Component #2: The Portfolio Plan

The Portfolio Plan, which is the "production schedule" for the vehicle development "factory", is the second component, found at the beginning of the VDP. The plan is intended to be a resource-compliant 10-year product plan that includes the introduction of new market segment vehicles, major redesigns of existing vehicles, and lifecycle plans for the current vehicle portfolio. Resource-compliant means that the necessary investment capital, production facilities, marketing support funds, engineering budget, and personnel are forecasted to be available to execute the plan. The plan is also compliant based on maximizing portfolio profitability and Corporate Average Fuel Economy (CAFE) requirements. The output from the plan is a 10-year new vehicle introduction cadence, market segment analysis, vehicle architecture strategy, powertrain plan, profit and volume forecasts, CAFE strategy, and a technology features plan. The Portfolio Plan is reviewed and approved annually by the NAO Strategy Board.

A program charter is created for each new vehicle program or major redesign of an existing vehicle in the Portfolio Plan. The program charter is issued to the VLE and the VLE Team for a vehicle in their respective market segment. This program charter defines the business purpose of the program and establishes broad performance objectives. These objectives are explicit, measurable, and briefly stated goals that are connected to the strategy of the business.¹ The charter officially communicates the NAO Strategy Board (NSB) approved vehicle program requirements and guidelines to the VLE and VLE Team. The specific and measurable objectives for a vehicle program include:

- Business purpose,
- Strategic objective,
• Results sought from the program,
• Portfolio price position and target profit margin,
• Program timing,
• Market segment positioning, and
• Engineering and capital budget.

With this program charter, the VLE and VLE Team will begin developing a conceptual vehicle to satisfy the objectives of the charter. Iterative negotiations between the VLE and the NSB can occur to modify the charter as the vehicle concept is developed.

A Market Segment Specification (MSS) is developed for each vehicle in the program charter. The MSS serves to clearly define the market segment position and customer requirements for a vehicle. This use of an MSS is grounded in the role that brand management has in determining the GM product portfolio. The MSS is created under the strong leadership of a Brand Manager (BM) who is responsible for the marketing strategies of a vehicle line. During the vehicle concept development phase, the BM works in partnership with the VLE and shares profit and loss responsibility and market share performance for the vehicle line with the VLE. As the program continues to develop, the Assistant Brand Manager for Product represents the Brand Manager on the VLE Team (see Figure 4.2).

After this initial development, the charter leads to a program contract.² The contract contains the vehicle’s specifications and the VLE and VLE Team’s response to how the vehicle program will fulfill the charter. The contract is presented to the NAO Strategy Board by the VLE and becomes a shared understanding of what the team will deliver and what the NAO Strategy Board will provide in terms of resources, support, and other requirements to the team. Ultimately, the VLE, VLE Team, functional directors, and the
NSB sign the contract. The contract clarifies the portfolio product assignment as defined by the charter for the vehicle, defines the boundaries of the vehicle program, and identifies the resources, economics, materials, schedule, and processes needed to successfully accomplish the charter. Opportunities for selective re-negotiation of a contract between the VLE and NSB are allowed when unexpected external changes adversely impact the ability of the vehicle program to fulfill the contract. The Portfolio Plan charter/contract process is the primary formal mechanism linking the senior management and the VLE Team.

To assist with this linkage, the Group Executive of the operating vehicle group serves as the sponsor for each new vehicle program. The Group Executive (refer back to Figure 1.1) is a member of the NAO Strategy Board and helps the VLE Team deal with unforeseen contingencies. In the role of a sponsor, the Group Executive advises the team when necessary on these contingencies which create potential areas of conflict and situations for error. When difficulties arise within the VLE Team’s operation, the sponsor may become a sounding board for the VLE by listening, providing ideas and helping the VLE clarify issues and sharpen options for action. The sponsor can be quite useful in helping the VLE and VLE Team view issues in light of the overall business and the needs of senior management when contingencies arise that affect the boundaries of a vehicle program. This provides both the VLE Team and NAO Strategy Board a way to resolve uncertainty and real-time issues with a clarified course of action that is effective for the VLE Team and NAO.

Component #3: The Four Phase Vehicle Development Process

The third element of the VDP is the Four Phase Vehicle Development Process (4ØVDP), which is a common process for executing vehicle development. It is the roadmap
that provides the standards, systems, and services used in the design and build of vehicles and is a critical business process of the VLE system. The 4ØVDP is a "stage-gate" approach that defines four distinct phases in the design and development of vehicles. Each phase serves as a review gate to ensure that defined exit criteria for that phase has been satisfied. Phase 0 is the concept development and preliminary design stage to demonstrate the feasibility of the vehicle. It is during this phase that the VLE charter is negotiated into a contract with the NSB. Phase 1 is the product prototyping stage of the vehicle where final vehicle integration and product validation are the primary results. Final manufacturing integration and process validation occur in Phase 2 when the assembly plant has been converted and pilot vehicles are built. After successfully achieving full volume production with satisfactory quality conformance, Phase 3 is entered and it marks the transition of the new vehicle into a continuous improvement stage.

The 4ØVDP uses Statements of Work (SOW) to integrate activities across multiple functional areas from the beginning of the vehicle concept to ultimately production. There are approximately seven program level review gates in the four phases with 40 high-level SOWs that translate into 200 mid-level SOWs. Each SOW is assigned to a specific functional area and defines the deliverables and key vehicle development interfaces at that point in the development process for that area.

While there are numerous other processes used in vehicle development at GM, the Portfolio Planning Process and the 4ØVDP are the two directly linked to the Vehicle Line Executive System.
NOTES


2. Ibid., p. 92.
CHAPTER SIX

PERFORMANCE MEASURES OF THE VLE SYSTEM AND VEHICLE DEVELOPMENT PROCESS

The framework considers performance measures of the business processes to determine the effectiveness of the processes in producing output from the organization and motivational incentives. Performance measures of the VLE System and the VDP are conducted through two primary methods: (1) tracking the progress of vehicle programs through the charter/contract process measures the throughput and efficiency of the VDP, and (2) a financial measurement system is used for determining the profitability of a vehicle line as it progresses through the VDP. As a result of these two measures, a compensation reward system is derived for the VLE.

(1) Rigorous Tracking and Throughput Management System

A Rigorous Tracking and Throughput Management (RT&TM) system was developed to measure the performance of the VLE and the VDP. Each vehicle program that is granted a VLE charter is tracked in the RT&TM system. The RT&TM system is intended to apply "manufacturing rigor" to the VDP for on-target execution of vehicle programs. It ensures that vehicle program and systemic organizational problems are visible early. This is accomplished by tracking all vehicle programs on a single chart and using a color-coded system of red or green to indicate performance to execution targets. The system links
vehicle programs with shared resources so that the impact of a timing delay in one program can be assessed in other programs where resources are shared (e.g., die engineering). Because the RT&TM system is a visible tracking process, there are opportunities to facilitate learning from the vehicle programs when bottlenecks are identified.

The RT&TM collects data in five VDP areas:

- Performance to completing 4ØVDP SOWs that are on the critical path and secondary critical path of the VDP. This represents 23 milestone dates for completion.
- Performance to program financial imperatives,
- Performance to vehicle quality targets,
- Performance to program staffing requirements, and
- Performance to other corporate strategy imperatives for flexible manufacturing and technology rollout.

Overall corporate performance goals for the VDP were established. These goals are summarized in Figure 6.1.

Improvements in the vehicle development process will influence many of these data. Given the timing of implementation of the VLE System, it is generally believed that effects on performance in the VDP by the VLEs will not be immediately measurable. With the current product development leadtime, the first major contributions will be recognized in the year 2000 models.
<table>
<thead>
<tr>
<th></th>
<th>Goal vs. 1994 Performance % Improvement</th>
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<tbody>
<tr>
<td>Lifecycle Engineering Costs</td>
<td>26%</td>
</tr>
<tr>
<td>Product Lifecycle Time</td>
<td>25%</td>
</tr>
<tr>
<td>Models Per Year</td>
<td>35%</td>
</tr>
<tr>
<td>Product Development Leadtime</td>
<td>25%</td>
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Figure 6.1 GM-NAO Vehicle Development Process Performance Goals
A financial management system was created to measure the profitability of a vehicle through the VDP. This system provides monthly information regarding the vehicle cost, program investment and engineering budget expenditures. The methodology for this system was identified during the internal benchmarking of the program management process at Hughes Electronics. Hughes Electronics indicated that the need for current financial information was critical to successful program management. Their system was capable of providing weekly updates. By analyzing their system, a similar financial management system was developed for the VDP.

The information from the financial measurement system is used in two ways in the VLE System. The VLE and VLE Team review this information as they monitor their progress on a vehicle development program. It is used in determining whether the program has satisfied the exit criteria of the various phases in the 4ØVDP. It is also used by the VLE in Product Line Profitability (PLP) reviews with the NAO Strategy Board. As part of the annual budgeting process, the VLE will present to the NSB the financial status of all vehicle lines in his or her market segment. This PLP review facilitates the opportunity to discuss program strategies to improve financial performance based on resolving product problems, incorporating new features, responding to the actions of competitors or future uncertainties in the market.
THE COMPENSATION AND REWARD SYSTEM

The compensation and reward system is one of the most significant processes in any organization. From measuring the performance of the organization in other processes, the compensation and reward process provides monetary and status incentives to employees. This becomes critical as a factor in the shaping the culture of the company. While it is recognized that monetary and promotional rewards bring only immediate gratification to the employee, they are extremely important to the organization. The compensation and reward process sends a message to the employees of an organization indicating the type of performance and behavior that is desired.

The compensation and reward process in NAO is three-tiered but common throughout NAO. The top tier is for executives in NAO. The second tier is for classified or non-executive employees. The third tier is for hourly wage personnel who are typically represented by a labor union.

Executive Compensation

There are three distinct plans within this level, based on executive classification.

Plan One. This plan is tailored for first- and second-level executives and consists of annual salary increases and bonus compensation. The annual salary increases are determined by the performance and relative contribution the executive has made to the organization. There are two possible ways that the executive may receive these increases:

- The first way is through a merit fund that is established to reward performance,
The second way is through a promotion based on the proficiency that the executive has demonstrated in completing their assignment. A proficiency promotion typically increases the status of the level of the executive in the organizational structure. These types of promotions rarely involve any significant change in responsibilities or reporting relationships.

Bonus compensation for executives has two elements.

- The first element is an annual granting of stock options that have a predetermined strike price based on stock performance at the time of the award.
- The second element is a monetary award which is payable annually when certain performance requirements for profitability and customer enthusiasm are met by the respective business sector and corporation. Because these executives are at lower levels in the organization, the composition of this monetary award is biased toward business sector performance.

Plan Two. The next plan is tailored for higher-level executives and consists of annual salary increases and bonus compensation. Again, annual salary increases are determined by the performance and relative contribution of the executive, and consist of the two methods outlined earlier. Bonus compensation for these executives has an additional element versus the two for lower-level executives. This additional element is a bonus award that focuses on the long-term performance of the business sector and corporation in attaining specific performance goals. Because these executives are at higher levels in the organization, the composition of these awards is biased toward corporate performance.
Plan Three. The third plan is strictly for the VLE and consists of annual salary increases, bonus compensation, and a long-term incentive plan. Annual salary increases are based on the contribution by the VLE to product line profitability, vehicle program performance in the VDP as tracked by the RT&TM system, and support of operating group and corporate strategies.

Bonus compensation for the VLE also has a new element in it. In addition to the normal bonus compensation received by higher level executives, the VLE is eligible for a long-term incentive plan. As a new vehicle program that was issued a charter in the Portfolio Plan is launched into production, a performance review of that program is conducted approximately one year after launch. This review assesses the program's performance in satisfying the contract requirements that were negotiated with the NAO Strategy Board. Based on results of the review, a VLE is eligible to receive this additional compensation award. This plan is intended to compensate the VLE for the long-term commitment of remaining in their position for two product lifecycles.

Classified/Non-Executive Compensation

The second tier of the compensation and reward process is for the classified or non-executive employees. There are eight levels of classification for non-executive employees. Employees in these classifications are eligible for annual compensation increases and profit sharing. The annual compensation increases are determined by the performance and relative contribution the employee has made to the organization.
There are two possible ways that the employee may receive these increases. The first way is through a proficiency promotion based on the performance that the employee has demonstrated in completing their assignment. This methodology can be used to promote employees through all classifications except into the executive level.

The second way to receive a compensation increase is through the annual administration of a merit plan. This merit plan considers the employee's current salary to other employees in the same classification. A mid-point is determined for each classification and compensation increases are given in two forms. For employees below the salary mid-point of their classification, a merit raise is received which is a permanent adjustment to the employee's salary. For employees above the salary mid-point of their classification, a merit award is received which is a one-time compensation acknowledgement for performance. Again, the amount of the compensation increase is based on the employee's relative contribution to the organization.

Profit sharing for these employees is one percent of their annual salary and some granting of stock options. The number of options granted is dependent on the employee's status in the classification hierarchy. Profit sharing is only distributed when the corporation attains certain financial performance measures.

**Hourly Employee Compensation**

The third tier of the compensation and reward process is for hourly wage personnel who are typically represented by a labor union. These employees receive annual pay scale increases and are eligible for profit sharing as determined in labor bargaining agreements negotiated by the union with the corporation. Again, profit sharing is only distributed when
certain financial performance is attained. Unlike the profit sharing award for classified employees, hourly wage personnel receive only a monetary award that is equal for all hourly wage employees.
CHAPTER SEVEN
THE COMPANY CULTURE

The framework suggests that a company's culture be primarily derived from the performance measures used. The linkage of performance measures to the compensation and reward process typically forms a significant portion of the company culture. Beyond the compensation and reward system, organizational culture can be defined as the pattern of shared norms, values, and assumptions that guide behavior and help people comprehend why things happen a certain way. Norms are informal, often unwritten rules of conduct and performing work. Values determine what is really important in the organization. These values are often signaled by the reward system and management style. Assumptions are beliefs about cause-and-effect relationships and about what people really mean when they say or do things.

In addition to "administrative heritage," organizational culture is learned. This learning comes from the culture of the society in which a company operates, the experiences gained in the company and the folklore of the company. This folklore consists of stories and legends, heroes and "goats" of the company.

As discussed earlier in the history of GM, many of these elements helped shaped the culture of the corporation. GM has had a long-standing tradition of decentralized operations and corporate culture characterized by the principle of autonomy.¹ Frequently used terms such as "turf", "territory", and "owner" refer to this cultural principle. The early
organizational structure of GM parallels and reinforces an organizational culture that emphasizes independence and self-reliance based on distinctive, differentiated, and typically self-contained units characterized by the phrase "functional chimneys." Integrating the various GM units into a whole has been a problem since the early years of the firm. Strategies to coordinate this integration have ranged from establishing financial priorities to invoking corporate values.

The early introduction and implementation in the 1980s of a common product development process, 4ØVDP, into the autonomous culture of GM had been an ongoing struggle for years. Although there was widespread recognition across the corporation that 4ØVDP faced significant cultural challenges, there were few systematic efforts to understand the cultural dimensions of product development process change. Clark and Fujimoto reported this same pattern where cultural issues in product development performance receive only limited attention by the management of an organization.² It was determined that 58% of the concerns and problems related to the early implementation of a common vehicle development process were autonomy problems.³ These concerns were typically captured in the key cultural rules for autonomy: "Put yourself before others" and "My way is the right way". The remaining concerns and problems were attributed to the new initiatives and process complexity associated with 4ØVDP.

The initial introduction of 4ØVDP created a culture clash between commonality and autonomy, which resulted in a stalemate. This culture clash also resulted in ambiguity in the implementation of the common process. An analysis of the concerns and problems of ambiguity found that 29% were attributable to mixed organizational structures and roles, 26% to a mixed understanding of the initiative, and 45% to mixed messages about the
Therefore, both in terms of organizational structure and employee and managerial perceptions, autonomy made the adoption of a common vehicle development process difficult.

The culture of NAO was significantly different from the one required for a strong, single-point program management system and a common vehicle development process. It was necessary to devise an implementation plan around this newly defined culture and recommend an appropriate rate of change. The cultural change effort and process needed to target not only the higher levels of the organization but must also extend to every employee. It was recognized that the top management of the corporation leads culture change. Only top leadership has the power to create change in the critical experiences that result in the learning of a new culture. If leadership is serious about cultural change, then their behavior, the corporate strategies, organizational structures, process and performance measurement systems must demonstrate congruency and support the desired culture. Culture change will come slowly since the current culture developed over a long period of learning.

In implementing the new VDP, which included the VLE System, Portfolio Plan, and common processes for vehicle development, the following issues for cultural change were identified by NAO leadership:

- Create a perceived need for change;
- Develop a clear vision of what change is needed;
- Be clear about what kind of culture is needed and why;
- Communicate the vision clearly, simply and often;
- Ensure that the strategies, organizational structure, processes and systems are congruent and supportive of the desired culture;
• Provide leadership by modeling the behavior that would result from the desired culture;

• Predict where difficult issues will occur and have a plan to deal with them;

• Test everything that is done against the desired culture;

• Consider how you would have done things in the old culture and reflect twice about doing them now; and

• Get plenty of feedback on your behavior since people may misperceive it based on past experiences.

Additionally, NAO leadership recognized that behavior toward decision making and information flow would have to change. The "hindsight bias" in decision making needed to be eliminated in all levels of the organization. Hindsight bias reduces the ability to learn from the past and to evaluate decisions objectively. Leading researchers in performance evaluation and decision theory have argued that, where possible, individuals should be rewarded based on the process and logic of their decisions, not on the results. A decision maker who makes a high-quality decision that does not work out should be rewarded, not punished. The rationale for this argument is that the results are affected by a variety of factors outside the direct control of the decision-maker. The hindsight bias causes inappropriate evaluation of the logic used by a decision maker in terms of the outcomes that occurred, not the methods that were employed in the decision-making process.

The open exchange of information and communication is critical to making the VLE System function because of its resemblance to a matrix organization. Receiving undesirable
information or bad news should not result in the information provider being reprimanded or "shooting the messenger." A motto of "Red is Good" was proposed to facilitate the identification and exchange of problems.

To facilitate this desired culture change, NAO leadership embraced the concept of "the learning organization." This concept features teamwork as its basis. Everyone -- from members of the NSB to the VLE and VLE Team members -- participated in team building and learning exercises. These experiences are described below to provide a sense of the kinds of training materials to which they were exposed:

- **Dialogue.** This is a method of interpersonal communication designed to help people learn collectively. The process develops group thinking to the point where thoughts and actions are developed together.

- **Left-Hand Column.** This exercise includes a method of recording what is said in a discussion (right column on a sheet of paper) and what an individual is thinking at the time of the statement (left column on the same sheet of paper). Reflection on the recorded statements and unstated feelings improves clarity in future conversations.

- **Ladder of Inference.** The ladder represents the steps taken by individuals to arrive at opinions about the world. Beginning with observations and experiences, people tend to progress up the ladder by selection of data from the observations, addition of meaning to the data, making assumptions based on the added meaning, drawing
conclusions, adopting beliefs, and taking action. Knowledge of the steps on the ladder helps individuals reflect and question their moves up the ladder, avoiding excessively rapid progress. Used in a group environment, the ladder provides a checklist to guide the group in assessing available information as they work to determine a decision or required action.

- **Advocacy and Inquiry.** Training here centers on obtaining balance in the use of advocacy and inquiry. Advocacy is the presentation and active support of a particular view. Inquiry encourages group involvement in determining a view by allowing the individual to present his or her reasoning behind a view while encouraging others to question and comment on the reasoning.

- **Managing Transitions.** Transitions are movement from "what was" to "what is to be" in organizations and teams. Training helps identify difficulties during change and potential ways to minimize the effects of the transition. Changes in organization, methods or membership are of particular interest.

After the above training had been conducted, the desired cultural change was tested when the decision was made to implement the new VDP and VLE System throughout NAO on January 1, 1996. It was acknowledged that this plan would accelerate implementation, force decision making on vehicles currently in development to operate under a new system, provide some experience prior to managing new programs from the Portfolio Plan, and accelerate the learning cycle with real-time feedback. It was also recognized that the
organization might reject this "untested" concept, transition to the new system would be disruptive, other elements of overall improvement strategy for the VDP were not available, and selection of the VLEs and staffing the VLE Teams would be challenging.

In 1998, the company culture of GM continues to change and is captured in its five core values.

1) GM is dedicated to products and services that create enthusiastic customers. No one will be second-guessed for doing the right thing for the customer.

2) Continuous improvement will set ambitious goals that cause the organization to stretch in achieving them and then "raise the bar" again and again. The belief is that everything can be done better, faster and more effectively in a learning environment.

3) Innovation will be used to challenge conventional thinking, explore new technology and implement new ideas faster than the competition.

4) Integrity is a mainstay of the culture, and GM will stand for honesty and trust in everything it does. This integrity requires to say what is believed and to do what is said.

5) Teamwork, defined as everyone thinking and acting together as one GM team focused on global leadership. The strengths of this teamwork will be the highly skilled people of GM and their diversity.

This new culture will continue to evolve over time based on reinforcement of values from experiences. The culture will feed into the future development of strategy for GM as revisions to that strategy occur.
NOTES


4. Ibid.


GM displays the classic organizational pattern adopted by many companies expanding in the pre-World War II period. For GM, this expansion began in 1924 with the first GM vehicle assembled abroad in Denmark. General Motors do Brasil was established in 1925, and in 1929 its first plant in São Caetano do Sul was inaugurated to assemble vehicles, produce bus bodies and automotive components. In Germany, Adam Opel AG was also acquired by GM in 1929, and in 1931 General Motors-Holden’s Ltd. was formed through the merger of Holden Motor Body Builders and GM Australia Ltd.²

GM responded to economic, political, and social forces to decentralize its organizational assets and capabilities and to allow foreign operations to respond to differences in national markets. The resulting configuration of distributed resources and delegated responsibilities can be described as a decentralized federation.³ In this federation, control and coordination were achieved primarily through the personal relationship between top corporate management and subsidiary managers. This social control process was supplemented by some simple financial systems to allow accounting consolidation and to manage the capital outflows and dividend repatriation.
The dominant management mentality viewed the strategy of GM as developing positions in key markets worldwide and managing foreign operations as a portfolio of independent businesses. This approach was literally multi-national, where each national unit was managed as an independent entity whose strategic objective was to optimize its situation in the local environment. The multi-national organization model created is shown in Figure 8.1.

In 1998, this organizational structure at GM has been modified as a result of grouping the corporation into business sectors (refer back to Figure 1.1). However, the organizational structure of the GM International Operations (IO) (shown in Figure 8.2) still reflects the multinational model.

CORPORATE STRATEGY AND THE INTEGRATION-RESPONSIVENESS FRAMEWORK

The strategy of GM to "Compete on a Global Basis" and to "Grow All Business Sectors" requires the development of vehicles that will appeal to a broad range of markets. These vehicles must be capable of providing customer enthusiasm regardless of where they are developed, produced or marketed. The strategy of GM to "Run Common" in all its processes and systems requires globally developing and producing these vehicles while still being able to adapt them for local customer requirements. This presents GM with the challenge of developing and adopting a common vehicle development process throughout the corporation.
Figure 8.1 Multi-national Organizational Model
The strategy to "Compete on a Global Basis" requires GM to understand the distinction between the intrinsic characteristics of the automotive industry, cost structure, technology and customers, and the characteristics of competition in this industry. This is important since adopting a label to be a global company requires understanding variations in underlying managerial tasks. These tasks include (1) global integration of activities, (2) global strategic coordination, and (3) local responsiveness, which define the nature of relationships between corporate headquarters and subsidiaries, as well as among subsidiaries in a multinational setting.4

*Global integration of activities* refers to the centralized management of geographically dispersed activities on an ongoing basis. The need for integration arises in response to pressures to reduce costs and optimize investment. This integration is typically seen in manufacturing activities where the production and shipment of parts or products is managed across a network of manufacturing facilities in various countries. Because of recent advancements in technology, this integration is also being required for other activities, which can be considered more of a service. Many firms are able to perform engineering of their products on a global basis and in certain cases, like in computer software, work continuously in its development. Recent trends for product development in automotive industry exhibit this same phenomenon.

*Global strategic coordination* refers to the central management of resource commitments across national boundaries in the pursuit of a strategy. It is distinct from the integration of ongoing activities across national borders. This coordination can be selective and non-routine unlike the activity integration. The development of a worldwide product portfolio and determining manufacturing capacities for those products is an example of this

-95-
coordination. This becomes critical as economies of scale are desired to reduce costs and economies of scope are desired to cover various customer markets. In a capital-intensive industry like the automotive industry, this coordination can prove to be the critical link in profitability and customer satisfaction.

*Local responsiveness* refers to resource commitment decisions made primarily in response to local competition or customer demands. Local responsiveness can also be critical in businesses where there are no meaningful economies of scale to be gained or proprietary technology required. This responsiveness becomes very critical for products that require local adaptation or differences in distribution across national markets. These last two items can provide a substantial competitive advantage for a company trying to create customer satisfaction with their products.

An Integration-Responsiveness (IR) Framework provides a methodology for capturing the pressures on a business that make strategic coordination and global integration of activities critical, versus pressures that make local responsiveness critical. The IR framework can be applied to the products and functions of a business as well as to determine specific requirements in response to these pressures.

The pressures for global strategic coordination include:

- **Importance of multinational customers.** This is particularly true if the product is commodity-like and purchase decisions are made based primarily on cost.

- **Presence of multi-national competitors.** The presence of competitors who operate in multiple markets indicates the potential
for global competition. Global strategic coordination is required to properly respond to these global competitors.

- **Investment intensity.** If an aspect of the business is investment-intensive, the need to leverage that investment increases the need for global coordination. Worldwide product strategies have to be developed and implemented quickly to make the large initial investments profitable.

- **Technology intensity.** Technology intensity and the extent of proprietary technology often encourage firms to manufacture in only a few selected locations. Centralized product development and manufacturing operations in a few locations result in the need for global integration particularly when the markets are widely dispersed.

- **Pressure for cost reduction.** Global integration is often a response for cost reduction. Cost reduction requires sourcing the product from low-factor-cost locations or exploiting economies of scale and experience by building large plants that serve multiple national markets. Either approach to lowering costs imposes a need for global integration.

- **Universal needs.** A product that meets a universal need and requires little adaptation across national market facilitates global integration.

- **Access to raw materials and energy.** Access to raw materials and energy can force manufacturing to be located in a specific area. Because of the centralization of these activities, a tendency in some
businesses would suggest the need for global coordination and integration.

The pressures for local responsiveness include:

- **Differences in customer needs.** Products that require satisfying a diverse set of customer needs require a locally responsive strategy.

- **Differences in distribution channels.** Differences in distribution channels in various countries and the differences in pricing, product positioning, promotion and advertising that those differences involve indicate the need for local responsiveness.

- **Availability of substitutes and the need to adapt.** A product function that is being met by local substitutes with a differing price-performance relationship in a given national market requires a locally responsive strategy. This is particularly true if the product has to be significantly adapted to be locally competitive.

- **Market structure.** Local responsiveness is usually desired when local competitors tend to control a significant portion of the market and if the industry is not concentrated. A fragmented industry with local competitors indicates that there may be no inherent advantages to size and scale unless product and process technology can be changed.

- **Host government demands.** Demands imposed by host governments for local self-sufficiency for a variety of reasons can force a business
to become locally responsive. These concerns could vary from
economic development to national security.

To understand how GM should operate its vehicle development process, it is possible
to map the pressures for global coordination and integration versus the pressures for local
responsiveness. The purpose of the IR framework is to assess the relative importance of
the two sets of conflicting demands and to determine which of the two provides strategic
leverage at a given point in time.6

The vehicles produced by GM have significant pressure for global strategic
coordination. For certain product strategies, the importance of multinational customers will
dictate vehicle design. This was recognized recently by GM in the development of their
global front-wheel drive minivan as consideration for the needs of European customers
influenced the development of minivans that were to be sold in the North American market.
Other vehicles are capable of meeting a wide variety of universal customer needs and
therefore, require little adaptation across national markets. As more automobile companies
become global competitors, GM must be able to understand the strategic intent of these
competitors and be ready to respond to their actions where it is most appropriate. The
investment intensity of the automotive industry requires GM to leverage that investment
through global coordination. Worldwide vehicle strategies are critical to making these
investments profitable.

This analysis concludes that the Portfolio Plan in the VDP resides high in the need
for global integration because of strategic coordination. Because the Plan is customer-
driven, input to the Plan is treated separately in the analysis with a high need for local
responsiveness which is captured through the "Voice of the Customer" at a local level and is discussed later.

The pressure for cost reduction drives global integration of the vehicles produced by GM. Beyond the traditional low-cost factors of material and labor, the engineering costs associated with the development of new vehicles become a contributor to the profitability of these vehicles. This reinforces the strategy of GM to "Run Common" in the use of common processes, systems and components across the corporation. The emphasis on common allows more efficiency, flexibility and speed to market. Again, running common across the corporation permits learning from individual experiences that enhance technology exchange for product and process improvements. This analysis concludes that the Four Phase Vehicle Development Process (4ØVDP) requires high global integration and low local responsiveness as a global process.

However, the vehicles produced by GM have significant pressures for local responsiveness. The national or regional specific differences in customer needs are most critical in producing vehicles that will generate customer enthusiasm. The differences in distribution channels in countries require GM to market these vehicles in very different ways. Local markets in a country or region will offer substitutes to the vehicles produced by GM. Additionally, differences in country and regional regulations will require significant adaptation of vehicles for local compliance. The market structure can be dominated local competitors but, is more likely to be influenced by other multinational companies. Occasionally, a host government will impose demands for local responsiveness primarily for economic development. Most countries recognize the need for growth from capturing a greater portion of the value-chain for vehicle development and production especially in
the area of technology transfer. All of these inputs can be considered as the "Voice of the Customer." This local responsiveness becomes a critical input to the Portfolio Plan.

The significance of these three analyses implies that decisions in the vehicle development process cannot necessarily be made as a one-time choice on which of the two dimensions to leverage. As a program management process, the global VLE System must have VLEs that simultaneously focus their attention on aspects of the process that require global integration and aspects that require local responsiveness and on varying degrees of strategic coordination. Figure 8.3 demonstrates the mapping of the Vehicle Development Process at GM on an IR grid.
Figure 8.3 Integration-Responsiveness Grid for the Product Development Process at GM
THE GLOBAL VLE SYSTEM

A significant conclusion can be derived from the mapping of the characteristics of the vehicle development process at GM on the IR grid. The positioning of the global VLE System on the grid suggests the need for multiple focal points for managing the process. This suggests that VLEs must reflect the need for multiple points of view and the need to integrate and be responsive simultaneously. The need to be multi-focal dictates that the internal organizational structure for the global VLE System be a matrix.

This matrix would have a Global VLE who is responsible for a family of vehicles produced from the same vehicle architecture. Each Global VLE would have Regional VLEs who are responsible for adapting the vehicle architecture in their geographic region. A Regional VLE would maintain a dual reporting relationship between the Global VLE and the executive in charge of their geographic region. The Global VLE would be a corporate officer and report to the highest level of corporate management. Figure 8.4 reflects this proposed organizational structure.

This structure would permit decision-making in response to local market conditions and provide global integration in the vehicle development process. From the experiences of implementing the VLE System in GM-NAO, it would be critical to clearly define the interfaces and decision-making responsibilities between the Global VLEs, Regional VLEs and regional executives-in-charge. Having a common understanding of the business processes and availability of the necessary information for making informed decisions and proper performance measures would have to be developed.
Figure 8.4 Proposed Global VLE System Organizational Structure
CURRENT STATE

GM has instituted a version of the VLE System globally and in February 1997 appointed five GM-IO VLEs. Along with the appointment of the IO VLEs, a VLE System Implementation executive was appointed in an analogous role to the NAO VLE System Process Guardian. Each GM-IO VLE has Regional VLEs reporting to them. This system differs from the proposed Global VLE System discussed earlier. Under the system implemented in IO, the VLEs operate within the International Operations (IO) and report to the IO Vice President for Design, Product and Manufacturing Engineering. The GM-IO VLEs are expected to maintain equal partnership with their GM-NAO VLE counterparts when product architecture is shared across vehicles worldwide.

This partnership relies on a "single-voice" concept for decision making that was pioneered in NAO during the consolidation of Vehicle Engineering Centers. When product architecture is shared in this concept, it is expected that the IO VLE and NAO VLE will attempt to gain agreement on product development decisions that impact one another. The VLE who will introduce the new product first in the marketplace has a "single-voice" designation for decisions when agreement cannot be reached. In this role, the single-voice designated VLE will determine and communicate these decisions to the organization. The IO VLE and NAO VLE maintain independent decision making for developing a product for their respective markets when that decision does not affect the other VLE.
NOTES


5. Ibid., p. 18.

6. Ibid., p. 22.


CHAPTER NINE

SUMMARY ANALYSIS

This chapter summarizes and assesses the literature on organizational structures, the interviews conducted to support this thesis, and highlights the challenges that exist for GM in implementing a global program management system for vehicle development.

LITERATURE

Literature on the strategy of organizational structure consistently cites that structure cannot be established independently of other elements in the business. Chandler has documented that the organizational structure, processes and decision-making mechanisms must be appropriate for the strategy of the company.¹ Hax and Majluf have expanded this premise by recognizing the need to additionally integrate performance measures for the processes and company culture into the development of strategy and organizational structure.²

The building of complex products typically involves the simultaneous development of multiple subsystems. Funk recognizes this complexity with his term "discrete parts industries."³ His intent is to identify the importance of teams in relation to the size and complexity of the products and organization. This complexity implies that a variety of
approaches to developing multi-functional teams are required. Wheelwright and Clark explore some of the alternative structures available for these teams and their impact to program management of projects. The key to many organizational structures for product development has been the decision making and roles and responsibilities of the team members as discussed by Wheelwright and Clark and Harris and McKay.

Much of the literature assumes that the creation of a team occurs simultaneously with the initiation of a new product or task. In many situations and companies, this position may be realistic. But in a company like GM, which is a mature and complex organization, the randomness of team creation is not possible. A structured approach with clearly defined roles and responsibilities works best to minimize the confusion that can be created. This is contrary to the recommendations of Senge, who suggests starting anywhere and moving randomly through the organization for team building.

Every company has an administrative heritage that has evolved from its history. Bartlett and Ghoshal discuss how this heritage impacts the ability of a firm to change and how it evolves a global organizational structure. The culture from this heritage can cause significant clashes in an organization, especially when common processes are instituted, as Briody suggests.

INTERVIEWS

The interviews that I conducted which dealt with the strategy of GM, reflected a strong understanding of the need to "Run Common." It was expressed that common
processes and systems provide the key to cost effectiveness, efficiency, and organizational learning. It was also recognized that to "Compete on a Global Basis" would require expansion of a common vehicle development process worldwide.

When asked about developing a strategic product portfolio, opinions were expressed about the need to "sense and respond" to changes in the marketplace versus traditional "push" methods that target customer needs and provide products to satisfy those needs. This is believed to be particularly true for changes in customer attitudes toward trucks on the issues of safety and fuel economy.

There was general agreement that the VLE System in NAO was working effectively and that current results exceeded expectations. It was estimated that the VLE System contributed an additional 20-30% of net income for trucks in 1997. This was accomplished by a close working relationship between the VLEs and marketing and production activities. It was also acknowledged that in certain cases the VLEs were limited in their ability to influence the total business. This was typically observed when the emphasis to "Run Common" imposed these limitations.

When asked about GM's culture, it was generally viewed as a conservative, manufacturing company, one limited by the understanding of its history. Discussions regarding culture often brought in words like teamwork, trust, and integrity. The general opinion was that the desired culture changes were in fact occurring. Concern was expressed regarding the potential for organizational stratification in understanding this new culture. It was felt that there was still "sanitizing" of upward information flow as it was presented to the NAO Strategy Board. However, the general consensus was that the element of trust was improving but further consistency was necessary.
The need for a GM "worldwide culture" was identified as necessary if the corporation was going to be successful with its strategy and in implementing a common global vehicle development process.

CHALLENGES IN IMPLEMENTING A GLOBAL VLE SYSTEM

Even though GM has focused its strategy on becoming the world leader in transportation products and services, there are many challenges ahead to implementing a global VLE System. Each challenge originates from some element of the Strategic Management Framework that I have used to analyze the organizational structure for vehicle development.

Beginning with GM's strategy, it is apparent that priorities have been identified to create a global company, especially through the emphasis on "Run Common." Creating a corporate-wide awareness of this strategy and developing the necessary understanding required for its execution through the entire organization is the first challenge. The GM-NAO Plan-to-Win provides a visible icon that represents building upon this strategy and translates it into strategic thrusts and initiatives aimed at customer enthusiasm. The globalization process will be facilitated by the existence of a GM-IO Plan-to-Win that is identical to the NAO plan except for modifications required for cultural reasons.

The current corporate organizational structure based on business sectors is a second challenge. The existence of multiple business sector strategy boards can impede the decision-making and approval processes for global vehicle programs. These business sector
strategy boards need to develop a sense of interdependence on each other rather than a sense of dependence or independence. This challenge is compounded by current differences in the management reporting relationships between the NAO VLEs and the IO VLEs.

There are several challenges in the area of business processes required to institute a global VLE System. Currently, the creation of separate Portfolio Plans for NAO and IO requires significant strategic coordination and integration. Without a recognized need for interdependence, this coordination can be overwhelming.

There are other common processes for vehicle development that have not been adopted globally. IO does not use the full charter/contract signing process, which is necessary for gaining a commitment between the strategy board management and the VLE Team for future vehicle development programs. Currently, IO does not use the Four Phase Vehicle Development Process (4ØVDP) or have a sophisticated systems engineering process for establishing detailed component interfaces. These two processes are crucial for transferring vehicle development work across international borders. As these processes are instituted, they will have to be capable and sufficient of global integration.

Globally accepted performance measures are still being developed. While these measures will monitor throughput and financial performances in the vehicle development process, a common compensation and reward system is still required. Compensation cannot be administered by region based on a combination of business sector and corporate performance. Improper alignment of priorities will result in different goal attainment. A country manager may be more focused on market share at any cost versus a VLE who is focusing on market share and vehicle line profitability. These types of differences will make teamwork in the culture of the company difficult to achieve. Even in NAO, rewards
for teamwork are becoming a challenge since it is difficult to properly identify and acknowledge all individuals of the team equally.

In addition to the differences compensation systems will have on the culture, there are many other challenges in creating a global company culture. As discussed earlier, there is considerable administrative heritage that has shaped GM since its beginnings. This division of culture goes well beyond today's business sectors. Inside IO alone are more than three different regional cultures based only on geography.

Even inside the Latin American Operations of IO, distinct country cultures influence the culture of the regional operation. To institute a strong, single-point program management system globally will require significant changes in the culture especially for decision making. For the VLE to have accountability and work with a single-point vehicle development integration "factory" will require the technically thinking minds of engineering to relinquish some power and authority.

Each organization will have to overcome barriers of waiting for failure because of the "not invented here" syndrome⁹. The traditional focus on technical competence will have to be replaced by a focus on customer enthusiasm and meeting program business objectives.
SUMMARY

The organizational structure of the VLE System seems most appropriate for the vehicle development process at GM. It is a logical choice given the corporate strategy and has the necessary business processes and performance measurements systems. The reward system of the VLE has been linked to critical performance measures. The culture of GM fosters customer enthusiasm, continuous improvement, innovation, integrity and teamwork, all of which are essential to the VLE System.

The VLE System provides strong, single-point decision-making through the VLE. This is critical since treating timing as sacred and leveling the workload of the engineering "factory" are two key requirements of the vehicle development process.

The VLE Team organizational structure also provides a "Front end/Back end" organization for GM in the NAO Passenger Car Group by placing the VLE close to the customer and concentrating functional resources. As a result, GM can develop targeted vehicles for specific market segments and take advantage of the economies of scale derived in the functional organizations. This will provide opportunities for using common processes and leveraging resources that can reduce the fixed costs of GM while enhancing learning and technology transfer.

Wheelwright and Clark state that a heavyweight program manager team is recommended as the organizational structure for projects that have more complexity, uncertainty and ambiguity. Platform or next-generation projects, such as a new vehicle, are most effectively executed with a dedicated core team and leader. This structure gives the team the focus, leadership and resources it needs to cope with turbulence in the
environment. It also allows the new product to fit well with the existing product lineup and operating systems of the business. The VLE System at GM certainly provides this organizational structure. The ultimate performance of the VLE System and its global adaptation will be measured by the improvements in customer and shareholder enthusiasm.
NOTES


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