Organizational Processes Analysis of Product Development in the Automotive Industry

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ABSTRACT

This thesis provides an analysis of specific process phases associated with the vehicle components development process at Ford Motor Company. I will be using the Organizational Process as the foundation to explore opportunities to improve the existing process.

As with any other organization, Ford Motor Company has areas of opportunity in the organizational arena. Being on the verge of the next automotive revolution, the organization needs to analyze whether or not it is in the right position to develop the cars for the future.

With more than 100 years of history the company faces some legacy challenges that permeate in the culture of today's organization. Being formed around figures of cult and the scars left by turning the company around to avoid bankruptcy could inhibit Ford from keeping pace in a demanding and changing industry.

In Ford's current organization, the product development engineers play a key role in engineering and developing the vehicles that people will drive in the years to come. The challenges of simultaneously developing trucks, high performance cars, autonomous, electric and hybrids vehicles, while keeping up with innovation requires engineers to be on top of their competencies. It also requires an organizational environment that supports them.

A comprehensive analysis of the process of developing automotive components is presented using the three lenses framework. This methodology reveals performance challenges in three categories or lenses: strategic design, cultural and political.

The organizational process analysis presents a desired state and the paths to achieve that change. It is proven that inefficiencies in the engineering process create higher cost in reworks, which could impair the ability to compete with technology companies looking to disrupt the industry.

Thesis Supervisor: Dr. Roberto Fernandez

Title: Professor, Organizational Studies
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Chapter 1. Introduction

“The hard stuff is easy; it's the soft stuff that is hard.”
Ray Stata, founder Analog Devices

The development of an automotive vehicle requires the understanding of critical attributes and the capability to execute designs without compromising those attributes (e.g. appearance, weight and cost). Product development engineers use advance simulations and engineering techniques to determine the right configuration of vehicles.

However if it were an exact science, most cars would look the same and would have similar architectures and execution of the attributes. When we assign people to the different attributes things acquire different values. For Company A the most important attribute could be cost while Company B could be more oriented toward reducing weight and producing more efficient vehicles.

The Product Development process is where those decisions over compromises take place, and the ability of companies to be profitable or survive is closely linked to this process. Consequently the people in charge of engineering and development should be able to present the information in such way that, data driven decisions decide the strategy of the company, or is there more to be considered?

Ford Motor Company and Product Development

Ford Motor Company is a large system; it contains a multitude of organizations, each one with its own complexity and unique issues. The Product Development (PD) organization is one principal actor in the business; it is responsible for turning a concept idea sketched on a piece of paper into a motor vehicle that complies with strict regulations and demanding performance standards, while meeting manufacturing and environmental
requirements. The PD organization is composed of teams of engineers whose sole job is designing the components that together will create the car. To achieve that, they will need to deal with different stakeholder’s needs ranging from understanding conceptual aesthetics restriction, to scale economics to federal safety regulations, all while keeping a system thinking perspective.

The engineers at PD employ a wide range of tools and trusted methods to enable program success. The increased accuracy of finite element analysis predictions reduced the need to perform actual testing to predict or influence the design. Improved communication tools removed the geographical barriers and eased transferring information to relevant parties. However, despite the great progress made through decades, no vehicle launch in any Original Equipment Manufacturer (OEM) is free from design flaws ranging from incompatibility in design than can be fixed on prototype builds to jeopardizing customer safety resulting in costly recalls. It can be said that the current method of fixing and preventing systemic issues requires improvement. Consequently, the burden of fixing or preventing things relies on the skills and abilities of the PD engineers, who despite a proven technical background are too often underpowered in the decision making process.

It is in the nature and history of the company where the lack of empowerment found its origins. Being a large organization with multiple management layers that is responsible for the interest of different stakeholders, management feels the need to have control over every decision made in the company.

Experience suggests that trusted methods do not mean trusting people, and it is the relationships and establishment of trust where the critical enablers of success lay.
How can a PD engineer achieve the demanding task of finding solutions and preventing systemic failures when he often finds himself in an environment where trust is scarce?

If there is such an environment, a good start will be understanding the origins that produced the current state of the company.

Building an Organization

In order to change an organization, one should look back the patterns that have forged it. The history behind the successes and failures will help us to understand the present and be better prepared to influence the future. More than 100 years ago, Ford Motor Co. was an innovative company but was defined around its figures and critical events. It all started with a game changing invention by the founder Henry Ford: the assembly line.

Henry Ford started The Ford Motor Company on June 16, 1903, and his revolutionary view allowed factory workers to assemble cars faster and cheaper than the competition. Converting those savings into lower prices for customers and higher wages for workers. In fact, Ford's wages were the highest at that time, contributing to the boost of Detroit and the greatest economic migration since the California Gold Rush. The affordable prices allowed the company to make more than a million Model T vehicles per year. During 1921, Ford Motor Company’s share of market peaked at 61.5 percent, leaving a small share of market to multiple competitors.

Not everything was perfect for Ford Motor Company, at its creation. The company was conceived with some birth defects that have accompanied through it history. From its start, management allowed cults of personality to form around leaders. Henry Ford was the man making the decisions, even after appointing his son Edsel as president.
Small or big ones, all decisions were overseen by Henry until his death in 1947. During that time, the company preferred executives that just followed orders over capable personnel with their own ideas. The company was described as “a dark, almost gothic place, with a shadow administration, activities shrouded in mystery and a roster of dubious characters running rampant on the premises” (Brinkley 2004).

Henry Ford finally ceded control after the death of his son Edsel. His grandson Henry Ford II took control on 1945, he forced changes in the culture of the company by replacing the personnel close to his ancestor Henry Ford. Though at some point inexperienced and impulsive, the young Henry Ford II eventually grew into a confident leader as the head of the Company. He created a similar imperial style to his grandfather, where executives wouldn’t last long especially if they defied his position. High level executives of the caliber of Lee Iacocca1 were fired because of being perceived as a threat to Henry Ford II. This sense of division and authoritarian management, influenced the company’s ability to keep competitive after a promising start. The managerial and organizational problems were made evident with the arrival of the Japanese automakers in the 1960s and aggravated during the oil crises of the 1970s.

The arrival of the Japanese automakers exhibited the inefficiencies under Ford’s operation, not only in the manufacturing ambit, but also in the product development area. Ford had to learn to run the business more efficiently; maximizing resources, and having long-term strategies under the principles of Lean Manufacturing2. Lean Manufacture is

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1 Lee Iacocca led the design of several successful automobiles like Ford Mustang and Lincoln Continental. He became the CEO of Chrysler and named #18 Best American CEO of All time by CNBC.com
2 Lean Manufacturing: A series of manufacturing and product development practices aims for high quality in engineering and manufacturing, resulting in a high price-performance value to customer. Researchers, Japanese
not only a way to produce goods, but a systematic method to reduce waste (including engineering waste). When applied to developing products, a Lean approach means focusing on having a continuous, integrated process of designing without reworks.

Ford Motor Co. struggled during those crises but survived, not only by creating new products and improving its practices, but also by complementing with the openness to change that few incumbents had at the time. Ford Motor Co. can be considered as an outlier as being one of the few companies that were able to adapt, survive and regain historic performance levels after facing radical technological innovations from the new competitors (Hill and Rothaermel 2003). The company was able to comprehend the evolving needs of people with different lifestyles. Most changes have been motivated by the pressure of their competitors, but Ford has also proven its willingness to evolve in order to anticipate the market circumstances.

The 1980s and 1990s were decades of continuous growth for the company, with year to year sales increases due to the high demand for larger vehicles and trucks. The Ford family didn’t have a representative at the head of the company until 2001. In that year the great-grandson of Henry Ford -William Clay Ford Jr or Bill Ford- began to command the company. In 2006 Bill handed control to Allan Mulally in order to prepare for one the biggest turnarounds in corporate America’s history due the critical state that company was facing as result of the late 2000s recession. Mulally was the first outsider to the automotive culture to run the company, and he introduced multiple changes in management practices. Some of these changes included shifting the market approach by managers and industry observers have the notion of “continuous improvement” has resulted in new problems and practical limits (Cusumano 1994).
creating vehicles based on segment platforms\(^3\) to increase commonality, reducing nameplates\(^4\) and brands around the globe to consolidate brands, and introducing the use of aluminum in heavy duty trucks to improve fuel efficiency and payload. Mulally stepped down in 2014 and passed control of the company to Mark Fields, a longtime executive who faced the challenge of continuing the progress made by his predecessor while facing the beginning of a new technology era.

Ford Motor Company has been a survivor, and has been forced to re-invent itself over and over. Although many success stories can be told from its history, the legacy came with deep wounds and resentment within in the company.

**Current Organization**

The current organization is the result of the intense competition in the automotive industry. As anticipated in the 1990s, all mass production companies converged into similar organizational structures and processes, with integrated engineering, marketing and manufacturing organizations and problem-solving processes. (Clark and Fujimoto 1991).

\(^3\) Vehicle platform: Vehicle Platform: those components and systems that create the basic understructure of the vehicle, particularly those most influential to crash. Typically, those are: front end structure (rails, aprons, front cross member), cowl and dash, front and RR floor pans, front hinge pillar, side rails and cross members, front and rear suspension, fuel tank & filler pipe & fuel lines, wheel house, package representative powertrain, steering gear, column and wheel. The platform does not include exterior sheet metal, fenders, hood, doors, roof, quarter panel, door lid, lower back panels, glass, instrument panel, seats, and interior trim. (Ford Motor Company n.d.)

\(^4\) Per Bryce Hoffman, when Alan Mulally arrived to Ford Motor Company, asked the executives to print a list of the all the name plates the company had over the world. Executives could not figure out the number, making it obvious that a consolidation of brands needed to happen (Hoffman 2012)
We can recognize a high level decomposition that is similar to other industries where the goal is to manufacture goods. For automotive industries we will identify them as Planning, Product Development and Definition, Manufacturing and Marketing, Sales and Service. Error! Reference source not found. Error! Reference source not found. represents the relation between those areas.

![Diagram of Product Development Cycle](image)

**Figure 1.1 Product Development Cycle**

The relation between areas is known as the Product Cycle, which is a constant iteration that enables continuous improvement by capturing user needs and autonomy for decision making on each level. In this representation of how automobiles are created, the Planning phase is where the upper management defines the strategy on what vehicles will be developed and when. Product Definition and Development takes that input and make into manufacture-ready components of an automobile. Manufacturing puts all those components together to form a vehicle and is responsible for the quality of the final assembly. Marketing and Sales, is the connection with the customers, not only for sales
but for continuous support and trying to capture their needs and wants input for future vehicles.

This paper will focus on the upper left area of the cycle, outlined in a box, because this represents the responsibilities of the Product Development organization at Ford. We can see how one end receives the vision and strategy from the upper management and how the final output is products for the assembly plants. It is not easy to turn that vision and strategy into a manufacturing good. To accomplish that goal more than technical skills on both sides are required to find the right compromises.

Here is an example of the criticality of creating the right product: during the most recent restructuration, as consequence of the economic crisis of the late 2000s, Ford Motor Co. was forced to close 14 Factories including 7 assembly plants, reducing its workforce by 30,000 employees. This earned the contempt of United Automobile Workers (UAW), the union that veils for worker’s rights in automotive factories. The UAW claimed that the Automaker was responsible for the loss of jobs because they were not designing cars and trucks that consumers wanted to buy (Micheline 2006).

It is true that one of the success factors of a factory is the design of the product. The impact of an inefficient product can doom the future of a factory and the community that surrounds it. All the crises and factories closing contributed to creating an environment where the people that built the cars didn’t trust the ability of the people conceiving the ideas. Nowadays assembly plants play a large role in the decision making process and the direction the company takes. However, the cult of personalities, hierarchical organization and the adversity to change resemble the early days.
It can be said that, giving significant control and power to manufacturing facilities helps to create quality products, but the automotive industry is on the verge of the biggest change since, probably the introduction of the assembly line. With technology companies making their introduction to the industry, the incumbent’s automakers should challenge the ways of doing things and the decision-making processes. Unless changes are made to provide empowerment in lower layers of the company, Ford will not be able to keep the pace with technology companies and their agile way to run the business⁵.

**Problem Statement**

This paper will highlight one of the challenges faced by engineers in the Product Development organization and their peers within Ford, during a specific phase of the product cycle during the interaction with manufacturing; it will also discuss how things can be done differently with a holistic diagnosis of the source of the conflicts. I will explore those challenges as an opportunity to change aspects using success and failure experiences observed throughout my career and a case study. The basis will follow a methodical framework to diagnose constraints of success in the organization, finalizing with recommendations on how to be an effective agent of change in cross-cultural and cross-functional environments. The ultimate goal is to address the following questions:

1. What are the challenges faced by Product Development engineers in an organizational setting?

2. How can they be better prepared to meet those challenges in an organizational environment that inhibits formation of trust?

⁵ At the moment Google and Apple, currently technology companies, are preparing their entrance in to the automotive and mobility sectors.
3. How can they become an agent of change for initiatives inside a cross-functional multi-cultural organization?

Research Approach

This work will use the three classic perspectives or lenses. Each perspective collects aspects of human nature from various social science disciplines (Ancona, et al. 2005). Throughout this paper I will describe each one of the perspectives as lenses to see different angles of the organization. In the following chapters the most important feature of each lens will be highlighted. Using the methodology by (Maanen 2005) questions on each questions will be followed to get a better understanding of the insides of Ford. The three lenses are:

- The Strategic Design Lens
- The Cultural Lens
- The Political Lens

Each one will be used in the subsequent chapters as follows:

In Chapter 2 using the Strategic Lens, I will review how the organization's tasks and information flow are designed, how the roles and relations are defined and analyze if the organization aligns to company goals and strategy. In this part the PD organization at Ford will be studied at detailed, compared to other existing structures and highlight challenges and opportunities based on such structure.

Chapter 3 will analyze, with the Cultural Lens the environment for the engineers at Ford. Being one large multi-cultural and multi-national company, awareness of the implications of Cultural Lenses is essential to drive change.
Chapter 4 will focus on the overview through the Political Lens; how power and influence are distributed, how different stakeholders are involved in the process and how conflict can be resolved.

Chapter 5 is a case study of how the three lenses come to play in a particular scenario during the development process. I will offer an analysis of two cases of conflict between the Product Development Organization and Manufacturing during the development of two new products at Kansas City Assembly Plant and Louisville Assembly Plant. The actions taken will be evaluated with the three lenses to identify the successful action and its explanation.

Chapter 6 will present the findings from the case study and propose the recommendations for the Management team on the actions that contribute to conflict resolution through empowerment of engineers.

Chapter 7 will provide my conclusions and reflections of the investigation and will discuss the consequence of implementing the findings and future studies that can be performed on the topic.
Chapter 2. Product Development Organization Strategic Design

“Coming together is a beginning; keeping together is progress; working together is success”.

Henry Ford

This section uses the first of three lenses: the strategic design lens. This perspective is key in understanding how organizations are conceived and planned. From a managerial point of view, when an organization’s design is properly executed, it maximizes efficiency and effectiveness. When analyzing an organization it is always important to first take a look and ask, “Do we have the right people working together and doing the right tasks? Does the company’s current structure support communication and collaborative work among critical parties?”

This chapter explores in detail what product development is, and what the roles and the grouping structure are in Ford Motor Company, advantages and disadvantages of the current organization. It concludes with an assessment of how the existing structure supports alignment to meet company goals.

Product Development

The need for restructuration conveyed the transformation of Ford into a modular and flexible organization that allows the corporation to focus both on product and technology development. A major catalyst of this changes was the acquisition of companies from different profiles and ideologies, including high-end European brands like Jaguar and Volvo as well as volume producer Japanese Mazda. As explained in the Introduction, after the 1990s there was a convergence in organization structures among
automakers, therefore this description of Product Development can be applied to others OEMs. In some companies it can be found with different names, like Research & Development or Design Engineering, but the functions described apply overall in the industry.

A detailed inspection of [Error! Reference source not found.] is shown below. Here we can see the segments that constitute the Design Generic process (Ulrich and Eppinger 2011).

![Diagram of Design Generic process](image)

**Figure 2.1 Generic design process for large-scale systems as well as small-scale**

The basic function from the Product Development unit is to take consumer needs (by involvement during the planning phase) and translate them into products with requirements and specifications for the factories to build. Achieving that function does not happen in one step; the process is long and iterative. Below is a description of the principal stages of the process:
• Planning: This stage bridges the product concept with the product design. In this stage, the high level decisions are made, including specifications of cost and performance targets, components choice, potential styling and layout. The importance of the engineering team is critical in assessing the technology available. For example choosing engines for a new program takes places during this stage, but engineers have been working years to prepare new motors strategy.

• Concept Development: In this stage, the styling of the vehicle is designed. Multiple alternatives are evaluated and market tested to define a single concept. It becomes critical to convey consistency of the design and the engineering parameters. This is not an easy task since it requires cross functional interactions and conciliations. This results in a series of complicated tradeoffs. Planning a new car is like trying to solve a huge simultaneous equation system. Organizational conflicts and difficult negotiations are inevitable (Clark and Fujimoto 1991).

• System-Level Design: Applied to an automobile, the term system-level design refers to the layout or packaging of the components in a confined space; the space for legroom in the back seat is an example of packaging. Basically it refers to non-visible, but tangible attributes in the overall perspective of the vehicle (roominess, quietness, etc.).

Defining the layout is a significant choice in the design process. A specialized team (basic layout, basic design, etc.) normally executes this, while maintaining close collaboration with the Product Engineer.

• Detail Design: This stage starts with the component choices, selection of supplier vs in-house source, new vs carry over. All with advantages and disadvantages,
normally the suppliers possess knowledge and expertise from around the industry.

In-house is limited to the knowledge within the company, but it reduces engineering cost, and allows for more control on the design and faster development turnaround.

After choosing the component type, the next step is to meet a complex measurable and subjective list of vehicle requirements, such as “When closing the door it should sound luxury”, or measurable attributes like closing efforts and decibels of NVH\(^6\) performance. The PD engineer is required to show compliance on all these attributes before starting the prototype and testing part, relying most of the time on Computed Aided Engineering (CAE) methods.

- Testing and Refinement: After completing the detail design, the next step is to build and test prototypes. Through the years, the amount of testing required has been reduced thanks to the accuracy of computer aided methods. Most of the tests are confirmations, or extended usage tests to reflect specific customer usage.

  It is important to have representative prototypes for identifying problems and improving the designs as early as possible. The ability of the evaluators and the effective communication among teams can prevent the encounter of problems late in the process.

- Production Ramp-up: During the late prototype phases, product development engineers and process engineers come together on the pilot runs. The goal is to have a smooth transition from product development to production.

\(^6\) NVH: Noise Vibration and Harshness, in general terms used as the quietness attribute of the motor vehicle (Ford Motor Company n.d.)
The transition from development to production is an evolution and requires the two teams to evolve together. Different companies have different approaches in regards to who should lead the effort. From my experience, in Japanese companies the team in charge of current production led the efforts with support from the product development team.

In American car companies, like Ford, a team of specialist is in charge of assisting on the transition for new models. The job of this team is to oversee that the product delivered by product development is ready to be picked up by the production time with a sharp separation.

We can already observe the complexity of the tasks in this process. It not only requires technical background on a given component to complete the tasks, but it also requires application, integration and communication. From this description we can see some of the challenges of the nature of the process:

Managing Complexity: the early stages are full of choices, from components choose, to level of innovation or proven design to supplier involvement.

Managing expectations: As a result of those choices, explaining discontent can occur along the process. One example that I will expand on during the case study is manufacturing; It is important to remember the limitations inherent to manufacturing processes; high quality comes with a premium, but paying more does not guarantee getting high quality. What is robust may not be easy to assemble. There are tradeoffs that are only evident after the integration in the vehicle. These tradeoffs exist regardless of the expertise of the engineers. When referring to qualitative factors as robust or easy to
install, educating people to align the expectations with the reality of the design intent is a challenge in every organization.

**Problem Solving:** The types of problems usually involve complexity and time pressure. It is important to provide integrative solutions, and for that, communication and teamwork is required.

To better address those difficulties, the people in the organization should be grouped accordingly. Next a review of the current structure will be presented to assess whether or not it is able to take on challenges described.

**Functional Organization**

To address the problems of managing complexity and choices, the formal organization in Product Development corresponds to a functional Organization. From moment they enter the company, engineers are assigned to groups that are mapped according to areas of the vehicle (interior, exterior) and related technologies (exterior, plastics) varying in size depending on the program required to support. Figure 2.2 below depicts the functional organization of product development.
Here we can observe the management structure for each vehicle section: Exterior, Interior, Electrical, Chassis, etc. each is controlled by a Chief Engineer and is subdivided into one or two modules\(^7\). An example of division of exterior includes Body Structures and Exterior Systems. The next subdivision is called Functional Area\(^8\) administrated by managers. Further down we find that the functional area encompasses 2 to 6 commodities\(^9\), assigned to a supervisor and the engineers' working team.

We can also see from Figure 2.2 above, that functional areas are largely divided into Application and Core Engineering. The purpose is to have dedicated teams

---

\(^7\) Modules: A group of components or subsystems, related to each other by position or function, designed and developed by a cross-functional team. A door assembly, including trim, glass, glass mechanisms, latches, handles, etc., is an example of a module.

\(^8\) Functional Area: An organization which performs the same function or type of work on a number of different vehicles.

\(^9\) Commodity: A class of parts or components used on most vehicles produced by Ford, e.g., mirrors, tires, wheels, and brakes
supporting the product’s needs and other team developing the new technologies and
providing technical support.

The segmentations of functional areas respond to similarities in the technology to
manufacture the components, the environments and regulations that rule them. For
example body structures (floor pans, pillars) and closures (doors, hoods) are, in principle
the same: stamped metal parts. However since structures need to meet structural
requirements and closures focus on achieving dynamic requirements, they are separated
into two different groups.

This structure allows specialization, expertise and technology development for
specific commodities; however, accomplishing this involves much difficulty in coordination
of the project tasks, and results in less responsiveness to market change.

This organization type is predominant during the early stages of the program
development cycle (see Figure 2.3) when, in order to plan and create the targets and
implement the findings from previous programs, a closer connection with the new
technology trends is required. Explained as the basic tradeoff and dilemma in product
development organizations (Allen and Henn 2011), having this Functional Organization
comes with the cost of the greater burden of coordinating project tasks among those areas
and longer response time.
Product Teams

The goal of all the organizations inside Ford is to build and sell vehicles. Each new vehicle is an endeavor itself. This is one of the cases where the whole is greater than the sum of its parts. The effort to coordinate one single vehicle involves more than creating the parts; it also involves manufacturing facilities, purchasing, marketing, etc. Most importantly, it requires communication and integration. Therefore, it makes perfect sense that Ford attacks those challenges with a Product Team organization.

Figure 2.4 shows an example of product team for a given nameplate, in this case, Ford F-150:
A product team organization is a group of people dedicated to a particular nameplate or program\textsuperscript{10}, at the top of that effort is the Chief Nameplate Engineer, whose responsibility is to oversee the execution from inception to production. The Chief Engineer is responsible for calling the decision or tradeoff that requires arbitration on a given vehicle.

The structure of product teams is complemented with program managers: a cross-functional team responsible for managing, planning, controlling and executing new programs in coordination with the cross functional areas that support the development:

In the case of engineering, for a given program the effort is consolidated by the in Program Module Team (PMT), a cross-functional group of individuals responsible for

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Business or Product Division Structure}
\end{figure}

\begin{footnotesize}
\begin{itemize}
\item Program: Model name of car, particularly where a top-level Engineering Vehicle Line defines multiple vehicles
\item Program Segment: Program segments define the phased launch of a program. An example of a program segment is the hatchback, notchback or wagon
\end{itemize}
\end{footnotesize}
module quality, function, cost, weight and timing (RLIS n.d.). This figure becomes more relevant as the program transitions from functional to product organization.

This structure has been proven to be very effective when the focus is on achieving the goals of a specific program. Therefore the inflection point towards program teams occurs in the final phases of the design during production ramp-up (see Figure 2.5). In the case of Ford, this is facilitated by the physical relocation of the Product Development Team into manufacturing facilities. However, this improvement in communication and integration is accomplished at the cost of a separation from the disciplinary knowledge underlying the project effort. When this is carried to an extreme, it will gradually erode the technology base of the organization.

![Figure 2.5 Product structure in the generic design process](image)

**Matrix Organization**

When a function or technology team interacts with a market or product-oriented team, the organization is often referred to as a Matrix organization. In the case of Ford Motor Company, there is no clear-cut boundary on when a product organization applies
and when a program does. In the day-to-day operations, the organization structure looks more like this:

![Matrix Organization: Combination of business or product division structure with functional organization](image)

**Figure 2.6** Matrix Organization: Combination of business or product division structure with functional organization

In the regular operations the product managers supervise the engineer's deliverables for specific commodities. Technology department managers keep track of changes in technology by working with suppliers in different programs. The product team is in charge of turning customer needs, expressed from marketing, into engineering deliverables to the technology team; they are also responsible for the program timeline and cost coordination. The interaction between product and function managers is intended to accomplish program needs with relevant technology.

This association allows a good level of communication. The product lead and function leaders communication is normally effective, and when required is leveraged by the Chief Engineer. This organization also allows an effective transmittal of lessons learned from project 1 to project 2.
A Matrix organization could be more oriented to either side, product or function. In the case study, the actual organization of a team inside Ford will be evaluated, to assess if the orientation is correct, or if a more product or function approach should be taken.

Linking

To complement the organizational assembly, additional systems are implemented. In the organizational context, linking provides the formal and informal processes to connect units that are separated by the organization design. In the case of Ford Motor Company we can see various existing roles complementing the existing structures.

Integrator Roles: To address one of the shortcomings in the functional organization, we found several systems supported by integrator roles. A good example is the door system; here we can find engineers in charge of the metal pieces of the doors, an engineer for the sealing subsystem and electrical engineers for the switches and harnesses. The role of the integrator is to deliver the functions that the door should perform as a whole. Another example on a greater scale, are the Program Module Team engineers, who are in charge of integrating the efforts among bigger teams, (chassis, exterior, interior, etc.).

Cross-Unit Groups: An example of this is the coordination during production ramp-up: engineers relocate to the assembly plants to work with manufacturing in order improve issue-resolution by combining the product development knowledge with the insights of manufacturing expertise. After achieving a milestone, product engineers returns to their home facilities; this is a temporary cross-unit group. The length of the cross-unit groups depends on the task. When a long-term representative is required for an indefinite time,
this is called Permanent. The idea is to bring representatives from involved areas together to coordinate efforts with respect to a particular program.

Supporting organizations: These groups are designed to help achieve the detailed activities of product development teams. These were not included in the organization diagram to avoid unnecessary detail, but their relevance lays in assisting with needs from IT support to coordination of engineering changes, or part management for prototype builds. These teams takes weight off the shoulders of PD engineers and allow them to focus on engineering tasks relevant to the function, relaying operational product-oriented tasks to supporting organizations.

Summary

The formal grouping organization inside Ford Motor Company is a Matrix organization, where engineers are assigned to function teams based on their technical expertise; they report to product teams, which are the vehicles that customers buy.

Ford Motor Company’s strategy includes accelerated development of new products that customers want and value, and working together as one team (Company n.d.). The grouping strategy supports these goals by having technical people working together to develop the products that customers want, keeping a close relation by interacting with the product teams. Linking strategy supplements these roles by attacking the intrinsic limitations of the existing structure. The proper alignment exists based on a clear corporate set of behaviors expected by employees, and rewards system include those behaviors as well as company objectives.

When talking about a Matrix Organization, it was defined as a mixture of functional and Product organization; that means it could be either more function or product oriented.
Under the assumption that the organization design is respected and the information flow is kept, one should expect a flawlessly operation. However on a regular basis links in the structure are bent or broken and Out of the norm operation occurs. This is a common pattern in large organizations involving humans and emotions, so it should not be a surprise to encounter such behaviors inside Ford. During the case study, those out of the norm behaviors will be explained in detail. Also, a specific department going through a restructuration will be used to review the strategic design implications of the goals.

One thing that can be immediately recognized is that enforcing the organization role with an iron fist will not be an integral solution; to provide one, two additional perspectives will be included the Political and Cultural.

The next chapter will focus on the political lenses and how power can go across the borders of the grouping design, benefiting or hurting team’s performance.
Chapter 3. Cultural Lenses

“Culture eats strategy for breakfast”

Peter Drucker

The human mind has always been an object of fascination and study. Understanding what motivates people to act in determined ways constitutes a part of explain our existence. What we can affirm by now, is that human behavior is not random, but to some extent predictable. Based on the observations of persons in similar situations, we can predict consistent behaviors based on the construction of mental models.

The existence of mental models driving human behavior is widely accepted by the scientific community. We have reached the point where we can explain and understand the resultant behavior: deeds and words, even without full understanding of the causing force. This is similar to physics, where we cannot see gravity, but can sense the effect it has on the objects.

According to Hofstede (Hofstede 2001), three levels of mental programs exist: the universal, collective and individual. The individual refers to the unique characteristics that make no two people exactly the same. The universal corresponds to the automatic responses we share as humans (and with other mammals) like fear, anger or compassions. In the middle of the two exists the collective programing, where most of identity is forged, creating cultures and organizations. In the same way that nations have raise helped by the collective culture, organizations can benefit by understanding and creating a proper culture.
Many definitions of culture exist, but Kroeber and Kluckhohn coined one of the most widely accepted. It runs as follows:

Culture consists of patterns (explicit and implicit) of and for behavior acquired and transmitted by symbols, constituting the distinctive achievement of human groups. This includes their embodiments of artifacts. The essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as products of action, or on the other as conditioning elements of further action (Kroeber and Kluckhohn 1963).

Geert Hofstede arrived at a shorthand definition and defined culture as follows:

The collective programming of the mind that distinguished the members of one group or category of people from another. (Hofstede 2001).

The relevance of understanding this definition is that offer the premise that segmented group's behavior can be analyzed understanding what is important
collectively. Hofstede's research focuses on the collective behaviors defined based on nationalities. This paper will explore that concept to explain the different contexts of global organizations, but will focus the analysis in an organizational setting inside Ford Motor Company. Complementing the structure design analysis made in Chapter 1, and additional definition is introduced: Organizational Culture

Organizational Culture

One of the most important contributions made by Edgar H. Schein to the study of culture and organizations, is a model to analyze organization. He describes that there are three levels at which a culture manifests itself: observable artifacts, values, and basic underlying assumptions. (Schein 1990).

The observable artifacts are everything that can be observed and fell when entering a company; layout, dress code, products. If one enters into a software company and compares it to a bank, he or she will see a different layout, dress code and a different way in which people address themselves compared to a bank; they will conclude that the two places have different organizational cultures, but that will not tell the complete picture of either organization or what it means for the members.

When trying to decipher what is meaningful for the members of a group, we face the problem of separating what people say from what they do. This is known as the theory of action (Argyris and Schon 1974). When people respond to surveys or interviews, we see the culture’s espoused and documented values. In order to learn the core part of the culture we need to make a more intense observation to crack the taken for-granted, underlying assumptions (Schein 1990). When doing this analysis of the culture, it is interesting to look for contradictions between values and taken for granted assumptions.
Finding contradictions can explain the existence of internal conflicts in organizations. The underlying assumptions are developed over time and develop more resistance to change as they endure traumatic experiences. Understanding all layers of culture helps explain why cultural change is so difficult.

Cultural Levels at Product Development

As a reminder, this part of the paper does not focus on driving a change in Ford Motor Company’s culture or in a particular department of it. The purpose is to make a culture diagnosis and examine its implications. Then, given the existing environment, they can provide the tools for engineers to get to the desire state.

The product development organization is considered to have a different culture than manufacturing or marketing. Even though this chapter only focuses on the first, this can be assumed because they have a different collective learning process, different artefacts and different values.

The place topic of this diagnosis is the Product Development Center (PDC), home of offices for PD engineers. The building is inside the Ford campus in Dearborn, MI, and is surrounded by buildings for testing, test track and even a hotel. A visitor to the company would notice the wide 2 floor building floor plan with closed, segmented and private cubicles. Numerous zones divide the building into closed areas. The activity in the place would appear calm: engineers attending teleconferences using headsets and small amount of interaction among them. The status symbols proliferate, such as reserved parking spaces, larger cubicles for supervisors and offices for executives (the higher the level, the larger the office). No special or different demeanor will tell who the superior is; the treatment around the office is cordial. The ambient is distant from being energetic,
slower pace, tight control of the working hours; it is a place where people want to arrive early, meet their hours and leave early. People will collaborate with each other if required. If a visitor stays long enough, there is the possibility he will witness conference calls with an assembly plant or supplier. In those meetings the levels of confrontation, conflict and fighting escalates, people yelling at the phone can be seen.

If one asks around, people are convinced and on board with the company values, even able to repeat them by memory. The One Ford plan helps the company to survive, and is catchy and easy: One Team, One Plan, One Goal. Basically, it invites people to work together for the company benefit. People in the building are very proud of their jobs; they wear t-shirts or jackets of the project they have worked on. As one manager pointed out, “These guys love cars, and they have the chance to work on designing cars. You don’t get better motivation. They don’t need hobbies. They work on their hobby”. The company has gone through difficult times trying to maintain employees’ jobs; for years the new hires were ex-employees who took early retirements. Therefore it is common to find people with 20+ years in the company. There is a high resistance to change and keeping up with technology. In recent times younger people have been hired, but they have often been brought to the norm of behaviors of the ones been there longer. People complain of long, unnecessary meetings and the lack of time to do “engineering work”.

The articulated values start describing the company, but a deeper inspection will be needed to fully understand the dynamics in the company. What people complain about the most is how decisions are made. There was a time when a vehicle presented a quality issue; the speed of the windows going up, was lower than expected. Since the door is a complex system, many things can influence this phenomena (voltage, glass variation,
rubber compound, door construction variation, weather). The Quality Director, after yelling at part of the door team, decided to apply a fix; he instituted a temporary solution, not only to that vehicle but all the vehicles across the company, just in case. From a business perspective, it might make sense to protect the customers. From an engineering perspective, it frustrates people not being allowed to find the best solution. When one starts digging deeper, they would find that underneath the corporate values, under distress, there is more than one plan and one goal. Using Schein Model (Schein 1990) we can represent the culture layers at Ford as follows:

Figure 3.2 Ford’s Product Development Cultural Paradigm

The company and the people believe in the product, but each suggest different approaches to the best solution for the product. The attitudes towards conflict resolution are overpowering and dictating over consoling and dialog. This is especially true when dealing with manufacturing. The sense of urgency will not afford them to step back and
find a root cause. Companies like Toyota embrace failures as an opportunity to learn and improve. At Ford, they avoid learning from failures. This brings about a culture where firefighting is rewarded more than engineering excellence.

Cultural Context

This section is intended to expand on the implication of dealing with a large international organization such as Ford Motor Company. The culture diagnosed in this chapter is not only unique to Product Development, but it refers only to the United State location. At the same time it can be used as a base line to explain the culture in other locations using the five cultural dimensions (Hofstede 2001). Hofstede defined 5 dimensions to explain differences between cultures in organizations. His research was based on a study made in one large country with data from 72 countries where the company had subsidiaries. The dimensions are gather from well-documented surveys and are explained as follows:

Power Distance Index: Refers to the perceived rate power distinction between boss and subordinate in the same social system. Due to the nature of Ford where managers and employees are constantly under international assignments, it is important to recognize this difference. More than knowing the actual values per country, it is vital to keep in mind that figure of “the Boss” won’t be as powerful in Australia as in India or Mexico

Uncertainty Avoidance Index: In addition to organization past driving risk avoidance, there is a natural tendency for people from different countries to act in a predetermined way. Being open to change, breaking rules and the accepted age of
management will change depending on the country or region. Singapore is one of the countries more open to those concepts whereas Mexico and Japan stand as a Higher UAI.

Individualism and Collectivism: Refers to the importance that people gives to personal time, freedom, challenge, use of skills, physical conditions, training. Western cultures have high preference over the things that improve their personal time, whereas for Oriental cultures the social context is as or more important. This correlates to group and work, or giving more weight to work than family. From a western perspective (Ford being located in the US), it is expected that employees perform best in groups. However, in places like Pakistan or Guatemala employees perform best as individuals.Mexico - which ranks towards collectivism- has a close relationship with the US and tend to adopt a similar culture.

Masculinity and Femininity: Is the index of importance of goals for men and women in jobs that can be performed by both. This is not to be confused with occupational difference. Among the countries scoring higher in this area, we find the idea of live in order to work. Managers are seen as culture heroes and more competitively. Japan is the prime example, followed closely by Switzerland and Mexico. In the other end of the index, we find people who express preference to work in order to live, have modest career aspirations and less job stress; Nordic countries are found in this category.

Long- Versus Short-Tem Orientation: Refers to values and how societies approach in the interactions. For example in business a long-term view implies that people will take the time to build a relationship and market position before execution. Short-term takes the relationship building out of the equation with a bottom line
perspective. East Asian countries are found in the first category and western and Europeans fits the second description.

To date, there is no better or worse when talking about the dimensions index; the right answer will be, “it depends on where you are”. People who are familiar with different social environments, recognize the existence of cultural differences among countries. The five dimensions allow us to focus on clustered categories, making it easier to understand or adapt to different global scenarios.

Summary

The cultural diagnosis found an overall agreement on the situation of the product development organization, but little consensus on the causes and how to fix them.

Ford’s strategy is highly recognized and employees believe in it. More importantly they believe that management overall follows the company values. The problem is not how people operate on a daily basis, but what people recognize as the norm is how the values and dynamics are compromised under unexpected circumstances.

The figures of power are still predominant and are a large factor of frustration inside the company. Changing that cannot be done from day to night even and will take years to make a difference. What can be learned is the existence of unexpected issues alters the norm of behaviors and when that happens the values are not followed.

Instead of trying to change the people in power who makes impulsive decisions, each member of the organization can reinforce the standard operation values (One Team, One Goal). What an engineer can be focus, is on aligning his/her objectives with other team’s goal regardless of the position in the organization.
To achieve that, recognizing the behavioral patterns in the organization is not enough. One needs to understand how to align people to their and company interest by gaining influence. The next chapter, discusses the political lenses. Political Lenses are the lever to bringing organization design and culture all together.
Chapter 4. Political Lenses

"Being leader does not focus in one, the leader is made by the ones surrounding you"

Javier Mascherano

The term “political” comes with a negative burden in most organizations, especially in the ones oriented to engineering or science. Science and engineering minded people struggle to accept the fact that, there is more than data and calculations driving the future of an enterprise. Interests of the people in position of power decide the future of large companies. The term “political decision” usually refers to a bad or hard to explain decision, made by the people with power to block or allows things to happen. The common view is that people at lower levels of organizations are powerless against the political directions. Sociologists have found that people in any position are capable of influencing others. The political lens allows them to recognize the importance of relationships and propose methods that can be influential in the political decisions.

Politics play a large role in Ford, as in any other large company. In this section I review terms that are important to acknowledge for any member of the organization in order to gain influence. By identifying the concepts and proposing a set of tools and actions for improvement, I will development a framework better related to engineering improvement processes\(^\text{11}\). In the following chapter -using past experiences- I will develop

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\(^{11}\) Six Sigma is a business process that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that minimize waste and resources. At high level focus in selecting a product or process and apply a cyclical methodology of Define-Measure-Analyze-Improve-Control and start again (Harry and Schroeder 2000).
an example from Ford’s product development team. Through the case study I will substantiate how political influence, even inadvertent, helps alleviate the engineering work and gain more impact.

**Interests**

For years the main theory among sociologists was that humans act rationally and are self-interested, following economics patterns and gaining the label of homo economicus\(^\text{12}\) (Anderson 2000). Organizational process and the political lens, recognize that social settings supplement the basic economic nature of humans. Being part of a society adds an additional dimensions to the way humans behave. The political lens helps us to answer the questions “why and when people cooperate”.

Going back to Ford Motor Company and the formal structure people are grouped together by shared interests –like the UAW-. However that is only one of the possible arrays or groups. As in any other organization, people will peruse similar interest based on demographics, location (country in the case of large companies), and position in the division labor (salary, contractors, part time).

Recognizing that people have interests, personal and collective is the first step in using the political lens. The following step, which is harder, is to recognize what those interests are. Individuals and groups will take one of the following positions as to organizational actions; supportive, indifferent, or opposing depending in how affects their

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\(^{12}\) Homo economicus: A term used in economic theories to describe humans as rational and self-interested beings capable of making judgments towards subjectively defined ends (such as accumulation of wealth and resources). This is used as a basic for the majority of economic models, where they assume that all human beings will act like homo economicus. The validity of this assumption has been questioned in some economic circles, with alternative assumptions proposed (Luthra 2001)
interests (Maanen 2005). The element that determines if people will act in favor or against, is power.

Power

Different authors in literature have define power in a myriad of ways. Bierstadt defined power as the ability to get things done despite the will and resistance of others (Bierstadt 1950), but this does not account for hierarchy; In an organization, is a person that get things done only by using his/her position seen as powerful, or as a bully? Another definition for power is “the potential ability to influence behavior, to change the course of events to overcome resistance, and to get people to do things that they would not otherwise do” (Pfeffer 1992) there are different ways to influence behavior: coercing with threats, inducing with payments or attracting them to want what you want (Nye 2004). The definition we are looking for is best aligned with the last one. Based on the approach of attracting people to want what you want the following sources of that type of power are identified:

Personal Characteristics: People generally recognize patterns among people with leadership skills: energetic, focused, emphatic, flexible, able to tolerate conflicts, and good at getting along with others by putting egos aside.

Scared and Value Expertise: It is common source in research and development organizations. The role of the so-called experts by their ability to diagnose and solve problems is a powerful one.

Past Performance / Track Record: One can build a reputation based on previous accomplishments and use that as a source of power to influence upstream.
Formal Position: Organizational position offers power to people over their direct employees, but it also offers power to the ones that control resources, assign tasks or control information.

Informal Network: The last one that can help balance the equation is the position in informal networks. It is a complement to the know-how, and can be referred to as the “know-who”.

Due to the nature of the sources of power, I will expand on the last one. There is a myriad of papers, books and courses to improve the personal characteristics. That topic is not specific to Ford. Therefore there is no value added by expanding the study to the company. The expertise and track record are the sources of power that, in general, engineers recognize the most, so those topics will not be detailed either. Formal position as organization chart is comprehensive. Where I see more value is in understanding the informal network as a source power.

Informal Networks

Most managers in companies pay a lot of attention to the organization structure. When facing difficulties, merges or revamping companies, the most common solution is a re-organization. What often is missed is understanding the informal organization: the networks or relationships that employees form across functions and divisions to get work done. (Krackhardt and Hanson 1993). The formal strategy is designed for the day-to-day operations: it reinforces the procedures designed for operations. What emerges to solve unexpected problems is the informal organization, and it has a great value if captured properly. In some instances companies will implement tighter controls as part of the strategic design to prevent informal paths. Due to the nature of the automotive industry
including Ford, unexpected problems will rise eventually; therefore it is important to understand the relevance of the informal networks.

Social network researches suggest that the position in the network and the size are important to get value out of it. Some make the point that the position is even more important than the size (Ancona, et al. 2005) introducing the dimensions of centrality and efficiency to dimension networks.

To understand the positions played in networks and appropriate description was made by (T. J. Allen 1969) the naming and descriptions are mostly independent of the kind of relations between the nodes:

Bridge: The individual in a network who connects with other groups, thereby bridging two or more groups together.

Liaison: Same function as a bridge, but has several connections to more than two communication groups. In Ford we have people working in Finance, and then a group that works in Manufacturing, and another that works in Product Development. The liaison will be somebody that serves as a link between these groups.

Isolate: As the name implies, this individual does not participate frequently or strongly in the communication networks. This could be by self-choice or geographical barriers. An example is the engineers working in satellite locations.

Star: The person with the largest number of interactions in the network. The interactions could be intra or inter groups.

13 Centrality: Is a multidimensional concept quantified using the concepts of degrees, closeness and betweenness. Refers to a central position in a social network associated with power

14 Efficiency: Measurable feature of a person social network
Gatekeeper\textsuperscript{15}: Defined as the discretion to exercise gatekeeping through a gatekeeping mechanism in networks; they can choose the extent to which to exercise it contingent upon the gated standing (Barzilai-Nahon 2008). It refers to a person who controls what information to pass on. A gatekeeper could be the engineer that has worked at the company for fifteen years, or the new engineer that knows how to use modern technology.

Those five types are represented in Figure 4.1

\textbf{Figure 4.1 Informal Networks Nodes Category}

The relevance of the network analysis is that it could be seen as a source of influence. In most organizations information is an advantage, and getting it early can help to anticipate opportunities or identify problems not evident to other teams in the network.

\textsuperscript{15} Gatekeeping Theories
Another advantage of mapping the network is identifying the position of self and the holes in each person’s network. In the constant clash between manufacturing and engineering, informal networks can be used to take a different approach. If the two groups act separately, conflict is more likely to occur. Liaisons and bridges assist to conciliate each group’s interests to strengthen the network and increase influence.

In addition to power and common interests, efficient networks contribute to being able to influence decisions. Efficient networks are the ones where holes are identified and filled. Filling the void in the networks can be done by working on task related project networks, friendship networks, or advice networks. Additionally one should recognize that, in the same way as interest, position in the informal networks changes. Being aware of the preponderance of the social networks and the “know-who” is an important resource for anybody trying to get something done in an organization.

Summary

Understanding that people’s actions are defined by their interests and influenced by figures of power gives a leading advantage inside organizations. Knowing how to move around the organization structure to gain influence and converge interest is the perfect combination to get things done. This levels the ground for people in any position with the proper network. If used along with technical proficiency limitless things can be accomplished.

We have learned that we cannot rely only on the organization’s strategic design; in fact we want it to be flexible to adapt to different circumstances. We also learned that cultural behaviors and patterns in organizations gravitate over the standard operation of
companies. What political lenses provide is a way to manage those out of the norm behaviors and standards.

In the next chapter, by using the three lenses combined in the product development organization I will sustain a systematic approach to being successful, getting things done, and being an agent of change.
Chapter 5. Case Study

“Start with good people, lay out the rules, communicate with your employees, motivate them and reward them. If you do all those things effectively, you can't miss.”

Lee Iacocca

This chapter will present a concise use of the three lenses in aspects specific to Ford Motor Company. From sections 2 to 4, I presented the challenges faced by engineers in PD using the three lenses perspective. However, not many granularity or alternatives were provided to drive a change; that is the goal of this chapter. This chapter will be complemented with specific situations during the development process. This encompasses actual challenges faced by the Body Exterior department of Product Development and assesses the outcome from the lenses perspective. To provide a similar base ground, this section is focused specifically on the ramp-up phase of the generic design process.

Organization optimization

As a reminder, in Chapter 2 we defined the PD organization as a matrix organization. On paper, that organization has the right balance between product and function. In Chapter 2, we omitted the discussion on what functions were favored by this division and what others could be further improved.

To analyze this, I will provide additional detail on the segmentation of areas to develop an automobile. By doing this, we can see the main areas illustrated as a part of an actual vehicle.
To select relevant areas for study, I propose an area with high complexity and interdependency. The area of study will be a door system. This part of the vehicle meets the criteria by including complex components engineered and manufactured in-house, a dynamic performance and interdependent components. The interdependent components include windows, latches and seals. These components are safety items\(^\text{16}\) that heavily depend on the actual door. Below represents the formal organization to engineer a door:

\(^{16}\) Ford designated Control Item Parts are selected products identified by Ford Engineering, concurred by Ford/supplier manufacturing. Control Item products have Critical Characteristics that may affect safe vehicle operation and/or compliance with government regulations. Unique symbols identifying safety and regulatory characteristics on components equivalent to the inverted delta (\(\nabla\)) symbol.
are all stakeholders on the design of a door for a particular program. The bar at the bottom right represents the focus of the organization, in this case heavily towards function. As described in chapter 2 there is a change in focus towards a more product oriented matrix during ramp-up, looking more like this:

![Figure 5.2 Door Systems Organization for Product](image)

Although the shift is an adequate solution to improve response time there are implications of executing this late in the program.

*Bringing a team together, improves communication and interactions. However it does not necessarily align interests. During the fast pace that characterizes ramp-up, nobody wants to be under the lights slowing the process. The most common reaction is to disregard and point fingers to avoid being the cause of program failure or delay.*

*The additional layer of management helps with prioritizing, allowing teams to act faster and in interest of the program. It does not necessarily place attention on the long term solutions.*
The proposal is to create an organization that shift more flexibly from product to function. In the specific case of product ramp-up, the organization should be able to support program needs, maintain close communication with the function and provide a systematic view to issue diagnosis and resolution.

By reducing the number of functions that need to align into product, we are reducing dispersion. The person responsible for supervising the program goals can have direct dialog with only one counterpart. This organization is more focused on product since the teams in the functional are organized by product, helping aligning interests. The role of the internal integrator is significant in the overall process. In the phases where a product approach is required, his responsibility increases and is directly inverse to the function approach. To overcome a potential loss of technical experience a core team working on technology remains for each component and is intended to have close communication with the engineers working on products.
The following charts represent a recommend approach during the design process phases.

![Diagram showing product-function balance during design phases]

**Figure 5.4 Product-Function Balance during Design Phases**

There could be different variants of this organization, and also problems defining where to place the boundaries for integration. In this particular case the experience suggests that those components interact closely during development and launch. Other components from the door like the interior trim panels or harnesses are not as close or dependent on the door itself. They could be parts of other systems.

The relevance of this study is to provide a different approach to the traditional way organizations are developed. There are always compromises and no perfect organization exists. What managers and leaders can direct their efforts is into creating organizations that are flexible enough to meet the different needs along the product development process.

**Managing Culture**
In chapter 3 we took an initial look at the culture inside Product Development at Ford. One of the goals of chapter 3 was to make clear that a culture diagnosis is specific, for a given organization, at a given time and location. What is more universal is how to manage the culture in an organization. In this portion, the analysis focuses on the same department as the one used in the proposed reorganization. It is important to create common culture that can nurture the intended bond between team members and relevant organizations.

I. Seeing culture: Ford Core Values

Foster Functional and Technical Excellence: Ford Motor Company emphasizes excellence in product development to support innovation. Training and programs to learn about practically everything are available to employees and these foster innovation.

Own Working Together: This was one of the biggest challenges Mulally faced when he joined the company; people were looking only at their interests. With the One Ford Plan, the company encourages employees to take initiative, participate, involve and support others.

Role Model Ford Values: This feature of the company culture brings integrity and positive behaviors among workers; it also reflects the focus on the product quality, safety and sustainability.

Deliver Results: In the end, it is all about getting things done achieving business goals guided by the company culture.

What is behind the core values is that the people working on engineering are curious, take pride in their job, like to innovate, are passionate and determined, and will
find solutions to the most challenging engineering problems—all while, finding joy through the ride.

II. Socializing participants:

The best way to reinforce the positive culture is to allow people to live the products, to let them be part of creating something. When people are jumping from one project to another, the feeling of ownership is lost. In order for people to immerse in the Ford culture, they need to develop that attachment.

Creating stories about the work done by others can contribute to better aligning the culture. Unfortunately, the most commonly-told stories are about failure, stop ships, re-design, and fights with plant managers. The stories that people in the company need to embrace, are the ones where Ford’s core values were present.

III Create Symbols

Management can use a set of tools to increase the sense of own work team; symbols. This can help to motivate teams or create a new identify in case of reorganization.

The power of images can be further exploded. Currently, employees embraces symbols of their work by showcasing components they develop. The goal is invigorate employees and remind them what they are working for, admire the novelty and its relevance. Engineers develop cars, but in the process they are saving lives by creating safe products. That should be reflected in the morale of the teams. The following picture is an actual door tested for safety tests showcased in the halls of body closures department.
Figure 5.5 Symbols displayed in the Ford PDC

Without any sign or explanation is just another automotive part in the halls. People will continue arguing about the different approaches, but the goal of a great product for the people should prevail, to maintain that mindset on the employees, the relevance and the value of their work should be a constant reminder.

Finding power

The engineer formation in Ford, pushes employees to be autodidacts. People will support and address questions, but it is the responsibility of self to navigate their way through the company. In terms of political lenses, the only known advice is to keep good relations with the management assistants, as they control the agenda and have access to the decisions makers. However, as in many other organizations, recognizing similar gatekeepers for the routine operations is more difficult. Going further, few people are aware that development networks are critical in getting the job done.

In this portion we will explore the standard informal network of engineers working at Ford during the ramp-up phase at an assembly plant. The information is collected from
the vehicle launch of the latest generation LCV at Kansas City Assembly Plant over a year of observation, visits to other plants, and interviews with colleagues and managers.

The goal of this phase is to hand over the design from product development to the manufacturing team. They work together towards its improvement, before committing to deliver quality with an “as is” product. The Informal network for that endeavor is depicted in Figure 5.6

Figure 5.6 Informal Network

The group representing the “Assembly plant” is the people who assess whether or not the design is suitable for the plant’s assumptions and capacity. This process involves the assessing critical and qualitative factors as easy to assemble or reliable. New Models is the organization that delivers product to the plants and assists with the

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17 From Lean manufacturing reliability is a product or method or procedure that always produces the desired results.
transition. The intent is to mediate and ensure a smooth ramp-up. The PMT Integration area is the product team; it manages and consolidates different engineering teams in dedicated modules working on the same product. Suppliers, have a lot of stake in the launch of the product. Suppliers are responsible for the quality of the components and the design in the case of full service suppliers.

The organization promotes a sequential interaction between parties. For example: 
If operators complain about the difficulty of assembling a component or system, they will communicate the issue to the line supervisor. The line supervisor will request help from the PMT or new models engineers to find a solution. If the solution requires an engineering or design change, then the product development engineer or the supplier is notified.

During my visits to Kansas City Assembly Plant (KCAP), I spent a considerable amount of time by the line talking with the operators. Their job consists of repeating a task 40 to 60 times an hour. It is understandable that they would look for ways to make their job for the next 10 years somehow easier. One consistent complaint is that the engineers who are developing parts do not consider them. It is not that they do not design to the standards, but they fail to actually think about them, listen to them and even explain the purpose of the design features. The operators have the power to shut down the plant if some work is too hard or if it compromises their work conditions. That involves escalation at the highest level of management, increasing uncertainly and stress. Understanding that

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18 Full Service Suppliers (FSS) Supplier with specific knowledge (design and/or manufacture) which is necessary for the development of the part. A Development Supplier provides prototype parts and will be a production source for the program.
people working at assembly plants are pursuing the same goal—building a quality vehicle—allows engineers to see the plant works as allies instead of opposition.

This case is the definition of power in Chapter 4; to influence behavior attracting them to want what you want. Getting people to accept the assembly conditions that a part was designed for, requires power and more specifically politics.

To convince people, requires personal characteristics as the ones described in chapter 4; leadership skills; energetic, focus, empathy, ability to tolerate conflicts, and ability to get along letting egos aside. From a network perspective, a PD engineer should act as a start and gatekeeper. A Start is having as many connections as possible inside the working network. A gatekeeper is to effectively report and get help from management when it is really needed. In Figure 5.7 a proposed informal network for engineers during a ramp-up phase is shown:

![Figure 5.7 Revised Informal Network](image-url)
This shows how PD engineer position has more centrality. At the same time the new network is more efficient. The PD subject is surrounded by all the stake-holders in the process. In contrast to being bridged, being at the center allows to gain insight on the issues and work on them before being escalated. The central position also allows them to have better control of the information flow to suppliers and colleagues. Being ahead of the managers in the information chain allows an engineer to become a gatekeeper, not to hide information, but to avoid getting unnecessary attention.
Chapter 6. Analysis, findings and actions

“\textit{It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.}”

\textit{Charles Darwin}

Diagnosis of the product development organization

The product development engineer’s capability is the foundation of engineering a vehicle. However, in considerable sizes organizations, capacity is out shadowed by prevalent figures of power. Engineers have proven being able to find solutions and design robust systems while following a plan. When the plan is replaced for what may look like arbitrary or political decisions debilitate the development process. Generating lack of trust, re-work and frustration. However, when people talk about how things are inside Ford Motor Company, very often sentences end in a “but that’s the way we do business”. The task of driving change in a large company at once is overwhelming. Instead, this analysis focused on three particular circumstances of the organizational setting that can be improved.

The analysis started reviewing the challenges faced by product development engineers: the ones intrinsic to the job and the ones due to the organizational environment. The scenarios chosen for the lenses analysis are not unique in the company and follow patterns seen during other phases of the development process. For example, while the politic lenses presented the tools to be better prepared to meet the challenges in a tough organizational environment, as an assembly plant, the tool is useful for any interactions. The same process will apply for defining design targets; recognize the
interest the people in power and making sure the informal networks help to be closer to the decision process.

Initially I presented the company status as dismal. In retrospect, labeling or describing an organization is always imperiled to subjectivities. By using the analysis tools of the three lenses, it is presented in the below charts a summary of the current state of Product Development.

<table>
<thead>
<tr>
<th>Strategic Design</th>
<th>Current State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix Organization, leaning</td>
<td>Matrix Organization, leaning towards function excellence</td>
</tr>
<tr>
<td>towards function excellence</td>
<td></td>
</tr>
<tr>
<td>Organizational structure support</td>
<td>Organizational structure support company goals</td>
</tr>
<tr>
<td>company goals</td>
<td></td>
</tr>
<tr>
<td>Integrators, Cross functional</td>
<td>Integrators, Cross functional groups and supporting organizations</td>
</tr>
<tr>
<td>groups and supporting organizations</td>
<td></td>
</tr>
<tr>
<td>Culture</td>
<td>Simple, hard work, loyalty, car-people</td>
</tr>
<tr>
<td>Strong spouse values, believe in</td>
<td>Strong spouse values, believe in brand and executives</td>
</tr>
<tr>
<td>brand and executives</td>
<td></td>
</tr>
<tr>
<td>Predominance of figures of power</td>
<td>Predominance of figures of power when facing uncertainty</td>
</tr>
<tr>
<td>when facing uncertainty</td>
<td></td>
</tr>
<tr>
<td>Political</td>
<td>Decisions influenced by the know who &gt; know how</td>
</tr>
<tr>
<td></td>
<td>Decisions takes place outside the formal organization</td>
</tr>
</tbody>
</table>

*Table 6.1 Current State of Organization*

The automotive industry is changing, in the next two decades the companies' portfolio of vehicles will need to change drastically. The big companies will need to adapt to develop the existing flagships and, at the same time develop more electric, hybrids and various degrees of autonomous vehicles and mobility solutions. It will required the product development team to integrate into product teams and functional technical capabilities.

Without the ability to attend both function and product the ability to keep the pace will be limited. As shown in the strategic design analysis showed, the current layout implies breaking off ties with the function to attend the product, limited accountability
against the programs and excessive layers of management for engineers trying to keep pace in a changing industry.

There are many things going well for Ford Motor Company as this is written; the company has posted record earnings traducing in better benefits for its employees. Also Ford is doing a terrific work with diversity. Still to maintain and attract talent, people inside the company, would like to see things changing. Not a drastic change in management but in the things that could make their jobs more pleasurable.

It is in the people living the organization where the answers and opportunities to improve lays, but this is not as easy as just asking. Managers have a hard time deciphering what people really want and trying to align it to the company objectives. In the case study, we don't see massive firing of people to change the politics or a revamp of the company floor layout to change culture. The case study covers examples of doing things different from the norm.

The study about the organization's strategic design provides an alternative view of how a department operates. At the same time, it is hard for managers to acknowledge the deeds of what people would like to change. The cultural and political parts refers to the behaviors that people will need to adopt in order to have more dependable engineering teams.

The following represent the future state of what can be achieve in product development using the lenses perspective.
### Desired State

<table>
<thead>
<tr>
<th>Strategic Design</th>
<th>Matrix Organization, delivers product excellence by function excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Organizational structure is flexible and support company goals</td>
</tr>
<tr>
<td></td>
<td>Systematic approach with strong links</td>
</tr>
<tr>
<td>Culture</td>
<td>Recognize, maintain and promote existing culture</td>
</tr>
<tr>
<td></td>
<td>Strong spouse values, believe in brand and executives</td>
</tr>
<tr>
<td></td>
<td>Passionate and decisive but prevalence of the One Ford Plan over people</td>
</tr>
<tr>
<td>Political</td>
<td>People with the know-how, understand the know-who</td>
</tr>
<tr>
<td></td>
<td>Recognize, built and improves informal networks</td>
</tr>
</tbody>
</table>

*Table 6.2 Desired State of the Organization*

### Implementation of the lenses

Combining the three lenses, we find a company where people are capable and willing to be more accountable. Because the function teams can act fast to meet the product needs, the problems with conflicting and multiple reporting chains are suppressed. Culturally, fostering the existing passion for designing cars and the pride on doing so will create a positive reinforcement loop. The company has achieved one thing that many others struggle to do, creating a message that employees identify with. In such a big organization it is hard to resume what the culture is, but that at the same time defines

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19 Positive loops tend to reinforce or amplify whatever is happening in the system (Sterman 2000)
the culture: diverse and complex. What is easier to see is the common behaviors that affect people with different personalities.

The existence of bigger than life behaviors of individuals larger than life have damaged the company and will continue to do so. Are they going away thanks to this research? Most likely no. However, this research presents a guide to make them more accessible and approachable.

The most actionable part of this diagnosis is the proposed strategic design. Implementing this requires they buy in of top management. The idea has been planted already, benefited of the use of informal networks to reach to the proper people. The plant is under discussion with senior management at the moment. A similar version of it, is highly probable to be implemented in 2016.

The cultural and political part are an ongoing implementation. Not even firing 99% of the management will drive a change in culture, because the 1% will end up implementing the old ways. The recognition of the importance of culture and politics offers invaluable additional tools to solve problems. Nevertheless efforts have been made by the creation of a culture team, which has been formed to continue to promote the values that are important to employees and unite the company. The actions of that team are focused on shifting from a hard work tradition to a life balance. No hammocks installed or planned yet, but significant steps have been taken to promote empowerment and life-work balance. A review of the culture team strategy will be needed once the new organization is rolled out to encourage cultural recognition among the new teams.
Chapter 7. Closing Thoughts

“The price of doing the same old thing is far higher than the price of change.”

Bill Clinton

Change to Affront Future

The constant evolution of the market has driven the need to design and engineer vehicles more efficiently. The engineering processes have been improved by incorporating methodologies like six sigma or lean manufacturing across the automotive industry. Still, no company is close to perfection and therefore relies heavily on the human capabilities of the actors in the mediation and resolution of engineering problems. However, less work has been done in this regard; the tools provided to engineers to become effective agents of change are limited compared to tools for engineering components. This shortfall has contributed to creating an organization where capable engineers can design and develop components to the highest standards, but they cannot influence the organization around engineering thinking. It leaves the risks that important decisions are made impulsively by figures of power.

As a team, product development needs to review the organization in order to function broadly and systematically. This is beneficial for program needs such as issues resolution, and thoroughly specialized during the components and technology design. Product development needs to focus on defining systems to integrate them better. This will set the foundation for an understandable command chain that facilitates issue resolution instead of the existing one where dispersion embraces pointing fingers and differences in priorities. In order to deliver value, engineers need to start working with areas where value is created. The existing knowledge from past experience should be
used to define the areas that need to work closer together using a systems thinking approach.

The change needs to start from within instead of waiting for it to be imposed by management change. The product development engineers have to develop skills beyond the traditional engineering skills.

There has been progress in identifying market needs as individuals, resulting in more customers. The next step is to raise awareness about the importance of workers as individuals to result in better employees. From a managerial perspective, recognizing the collectivism and individualism that creates a particular culture will set a sense of ownership and value. At a working level, engineers need to understand that people are making decisions all the time, and those decisions include whether they like us, want to help us or not. Once that is acknowledged, the great news is that we are able to influence those decisions.

Challenges in Overcoming Change Aversion

By the description of the organization, one can sense the animosity surrounding the company regarding aversion to change. Also, organization design will be subjective and one design over another will represent differential performance between areas. This and other organizational challenges will be the first barriers for engineers to face while trying to become more influential.

This study is based on the premises that appropriate competences will allow engineers to overcome the day-to-day operations. The engineers cannot neglect the premise of this work: the assumption of competent people that are able to work their way around the system to deliver regardless of its existing faults. It is also based on a gained
reputation that backs them while trying to become an agent of change. The steps to become an agent of change start with learning the basics: getting familiar with how the organization and the systems work, and then build a career that shows how good you are despite the existing environment. Then based on an educated understanding of the environment—including the organizational structure, cultural and political analysis—they will propose changes.

Changing the System

This work started with an intent to drive change in Ford Motor Company. It was nourished by the frustration of, from an engineering role, the difficulty of driving change. When trying to change things there is always the risk of “trying to boil the water,” and that’s where most of the good ideas fall short. The intention is that, at this point, the reader realizes that good ideas are not enough to drive a difference. That is when we blame decision makers for not seeing how good an idea is. There is a chance that it might have been a good idea but we failed to win over the audience. In human behavior nothing is as absolute as good and bad.

In order to improve the development process, it is essential for the product development team to recognize the relevance and future role of PD engineers and focus on building the ability to influence in parallel to the engineering skills.

Whether through formal training or as individual efforts, we need to identify ways to complement the engineering formation. This should start with incorporating aspects of organizational process, and in the long-run move to establishing specific items like “creating a strong informal network” as part of the career development goals and a requirement before taking on leadership roles. These findings using the organizational
process should be the guide for carrier development, which with time will contribute to a more Organizational Process-enabled culture.
Works Cited


