Trends, Factors and Public Policy Influences on the Greening of Industry: A Review of the Automobile and Building Sectors

A Major Paper

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I.

Introduction: Sustainability, Organizational Change, Public Policy and the Diffusion of Innovation

The depletion of natural resources and the generation of pollution across the country and worldwide have been fundamental problems ever since the beginning of the Industrial Revolution. Only in the last 30 years with the creation of the Environmental Protection Agency in the early 1970s and the Clean Air Act of 1970 have environmental issues such as air and water quality gained the national and global attention they deserved. Thousands of initiatives, standards and policies were prescribed to alleviate environment damage. While 'command and control' environmental regulations have helped to manage pollution, regulations are limited both economical and politically in making further progress to manage pollution and resource depletion.

Two of the main economic sectors contributing to the degradation of the environment are the automobile and building industries. Between 1965 and 1995, the number of households with automobiles increased from 80 percent to 92 percent (Skinner 2000) and the number of households with two or more automobiles increased from 30 percent to 60 percent with increasing affluence.

The improvement of automobiles and their use in American society is unparalleled. "The most developed form of the organized use of the auto as a technological object and as a consumer good can be found in the U.S.," (Freund & George 1996). Concern for the impact automobiles had on the environment

grew with the passage of the Clean Air Act of 1970, which set standards for air pollution and emissions. Yet as the number of vehicles on the highways increases, there is still cause for great concern over the damage done to the environment. As pointed out by Freund and George (1996):

> "In 1993, approximately three-fifths of the carbon monoxide, one-third of the nitrous oxide, one-fourth of the lead and one-fourth of hydrocarbon emissions from human sources in the U.S. were created by motor vehicles. According to Environmental Protection Agency data, in 1990, road vehicles accounted for 37 percent of the total metric tons of all air pollutants from controllable emissions. This was the largest single source of air pollution, ranking ahead of stationary fuel combustion, industrial processes, solid waste disposal and other sources."

Cars are not the only source of the problem. According to a 1991 survey, buildings accounted for 36 percent of energy use and 34 percent of carbon dioxide (CO_2) emissions (Norberg-Bohm 1991) split nearly evenly between residential buildings and commercial buildings.

Indoor air pollution are just as important as emissions from buildings. Environmental researchers say the chemicals inside the buildings could be even more harmful that the ozone depletion (Piehl 2000). According to the EPA, indoor "air quality [is] one of the top five environmental health risks of our time," (2000).

In response to serious environmental problems, a political and environmental movement was born. The 'green movement' gained in popularity during the early 1970s as issues of industrial pollution came to the forefront. During this time, the level of the regulations were strickly command and control. But as the greem movement gained strength, command and control strategies of

the 1970s changed to more voluntary action in the 1990s. The main goal of the green movement is to change industrial practices to reduce or eliminate environmental hazards. The movement has made significant strides, even though there is still much to be accomplished, particularly with the automotive and building industries, as these two sectors contribute vast amounts of pollution in the environment (Sale 1993).

This paper examines the current trends and motivational factors that are influencing the building and automotive industries to move to acceptable 'green' practices. More specifically the paper investigates diffusion innovation and organizational change as means of operationalizing the 'green' trend; documents current trends and motivational factors in 'green' manufacturing and other practices within the building and automotive industries and; ascertains the ways in which public policy influences green practices within these two industries.

A. Objectives and Methodology

The first objective of this paper is to analyze forms of diffusion of innovation and organizational change that affects adoption of green practices and actions as a means of operationalizing the green trend. The second objective is to discover the most recent trends and motivational factors in green manufacturing and other practices within the automotive and building industries. The third and final goal of this research is to explore the manner in which public policy has and can affect green practices within the automobile and building industries.

The automotive and building industries were chosen for review in this paper because they are important sources of pollution and play a critical role in the sustainability of the community and environment. In addition, the centralized and decentralized nature of the automobile and building industries, respectively, will provide an opportunity for comparison of the trends, motivational factors and public policy initiatives that have an impact on green practices.

To accomplish this paper's objectives, secondary data sources were collected and examined. Data was obtained primarily from the existing literature on green advancements, green public policy initiatives and other factors surrounding the green concept within the automotive and building industries. Secondary sources included newspaper articles, governmental and non-governmental reports, academic and trade journals, as well as case studies focusing on emerging green practices within both industries.

Two databases of the current green literature was created (Appendix 1 & 2). Examination of the literature revealed certain themes and trends. Two seperate matrixes of these themes and trends was created and examined (Appendix 3 & 4) including their internal and external motivational factors. It became apparent that the trends fell under three distinct yet affiliated categories: (a) product; (b) process; and (c) supply chain. It is important to make this distinction for several reasons. First, separating the trends by category clarifies and organizes the trends and the related motivational factors. It also creates a framework for examining the trends.

Trends that occur within the product category speak to initiatives that directly affect the product design such as auto fuel efficiency, emissions or fuel source. Similar to the product category, the process category deals with plans that impact the actual production process for example low impact construction practices in building and pollution prevention in auto product plants. The final category, supply chain, deals with the relationship between the suppliers of parts and materials and end-product manufacturers and the relationship between the end-product manufacturers and the consumers.This implies a “cradle to grave” supplier-manufacturer-consumer relationship. The supplier-manufacturer relationship will be discussed as the matrixes were created from the perspective of the respective industries.

Internal motivational factors prompt an organization to act or perform in a certain way based on its intrinsic needs. An example is financial gain. External motivational factors are circumstances outside the organization that pressure, influence or even force an organization to behave in a specific way. For instance, industry-wide standards may force an organization to rethink its operational and functional duties. Some factors are both internal and external, depending on the organization’s perception of the situation and the actual situation.

II.

Sustainability, Organizational Change, Diffusion of Innovation & the Role of Public Policy

Before the final matrix and the results of that analysis can be discussed, a theoretical base must be established. Analysis of the literature also suggested the need to place the greening of industry into a greater perspective. The concept of sustainability, organizational theory and diffusion of innovation theory provides a foundation for the greening of industry. However, the focal point of this research is to establish how public policy influences the automotive and building industries and their inspiration for green practices and technology.

Theories on organizational behavior and diffusion of innovation play an instrumental role in describing the greening of the automotive and building industries. In order to understand the complexity of the greening of the automotive and building industries, it is important to discuss organizational theory and concepts regarding innovation.

There is also a direct correlation between motivational factors and public policy. This link is in the role of how regulatory pressures sway organizations. Different policies elicit different responses. There are two broad category in which the different types of policies fall under: mandatory and voluntary. Similarly to the rate of adoption of innovation, each category often evokes certain responses. This chapter will highlight the key connections between these

theories and public policy that directly affect the automobile and building industries.

A. Sustainability

The ultimate goal of the green movement is sustainable development. The green movement deals with implementing environmentally and ecologically sustainable practices and methods during the production and building processes. But what does the term sustainable mean? There are a variety of definitions for the concepts ‘sustainable’ and sustainable development.’ It is important to note that these terms do not necessarily refer to the same thing, even though they are often used interchangeably. Hart argues that “sustainability does not mean sustained growth,” because at some time, a community stops growing. However, it can continue to improve and enhance the quality of life. Roseland agrees, stating “sustainable growth and sustainable use [are used] interchangeably, as if their meanings were the same. They are not. Sustainable growth is a contradiction in terms: nothing physical can grow indefinitely. Sustainable use is applicable only to renewable resources,” (1998).

There are three reoccurring themes present in almost all of the definitions of sustainability: an ecological/environmental perspective; an economic perspective; or a social/cultural perspective. Most of the definitions fall under two of the three themes, while more recent literature calls for the use of all three themes in order to work toward a more unified definition (Cerna 1993).

Farrell and Hart argue “there are two general conceptions of sustainability,” which are often seen as being in conflict with each other (1998). The first is called the critical limits view, which focuses on the natural assets – (e.g. air, water, forests, etc.). The second is called the objectives view. In this view, social, economic and ecological needs are balanced, thus attempting to meet more of a variety of human needs (1998).

The World Commission on Environment and Development, otherwise known as the Brundtland Commission (Hart 1999; Ramani 1994; Manzo 2000; Toman 1994; Norton & Toman 1997; Walter & Wilkerson 1998; Starik & Rands 1995; Blassingame 1998) defined one of the most popular definitions for sustainable development. The Brundtland Commission defines sustainability as:

> “…..meeting the needs of the present without compromising the ability of future generations to meet their own needs; sustainable global development requires that those who are more affluent adopt life-styles within the planet’s ecological means; sustainable development can only be pursued if population size and growth are in harmony with the changing productive potential of the ecosystems.” (WCED 1987)

The Brundtland Commission definition has been the mainstay definition used by researchers and communities alike. The President’s Council on Sustainable Development has even adopted this definition (PSCD 1997). But despite its wide popularity, the definition has been subjected to criticisms. Stairk and Rands argue that the definition is questionable because it can be perceived as “anthropocentric, indefinite on what needs and whose needs have priority, silent on change in technology and unclear regarding the benefits, costs and strategies of

inter-generational sacrifice and transfers," (1995). The definition was also accused of not taking to account the fact that economic growth has an irreconcilable relationship with sustainable development, meaning the more growth for environmental recovery that is sought, the further harm is done to the environment (Manzo 2000). Manzo maintained, however, that the definition helped the concept of sustainable development become mainstream in "economic development and political institutions because it does not fundamentally threaten the status quo, for which the imperative for continued growth is a crucial element," (2000).

B. History and Key Concepts in Organizational Theory

Since the 1950s when Chris Argyris first used the term 'organizational behavior', organizational theory evolved into a remarkably multi-disciplinary field (Porter 1996). At first, psychologists dominated the study of organizations, but this began to change in the early 1970s, as sociologists began studying organizational phenomena (Porter 1996).

Porter states there are two significant accomplishments that the study of organizations has provided. First, the field of organizational studies has been a major factor in placing "organizations and the management of organizations under critical scrutiny," (1996). Secondly, the collective literature has exposed the uselessness of oversimplified conclusions to organizational and managerial problems. In other words, the field of organizational analysis has essentially proved that "things are not always as they seem," (Porter 1996). The findings in

numerous studies have demonstrated that there often times different reasons for how organizations operate than initially anticipated.

There are numerous definitions of organizations. Max Weber (1947) defined organizations as the “corporate group [which involves] a social relationship which is either closed or limits the admission of outsiders by rules,” (Hall 1995). Amaitai Etzioni looked at organizations in relation to the concept of bureaucracy (Hall 1995). Etzioni described organizations as “social units (or human groupings) deliberately constructed or reconstructed to seek specific goals,” (1964). It is important to mention that these definitions do not focus on voluntary organizations, as it is out of the scope of this paper. However, voluntary organizations are a significant element within the organizational field and there is a noted distinction between an organization with paid employees and an organization with employees who volunteer.

Just as there are numerous definitions for the term ‘organization,’ there are just as many typologies and taxonomies to categorize them. Carper and Snizek (1980) state that organizational taxonomies are examined either theoretically or empirically. The term ‘typology’ is seemingly coordinated with theoretical research on organizations; likewise, the word ‘taxonomy’ is often used with empirical studies. Although both terms are often used interchangeably, they both have very specific meanings (Hall 1995).

There are several different and frequently cited typologies listed under both theoretical and empirical approaches. Theoretically, their societal region, such as medical, agricultural, and educational (Hall 1995), often classifies

organizations. Parsons specified a four-type organizational design based on the kind of role or objective served by the organization (1960; Hall 1995; Carper and Snizek 1980): (1) production organizations; (2) political organizations; (3) integrative organization; and (4) pattern-maintenance organization (Parsons 1960; Hall 1995).

Several researchers have attempted to establish taxonomies by conducting empirical research. Haas, Hall and Johnson attempted to create an empirical taxonomy by using 99 variables examining the most common forms of organizations. Initially, the results of the study produced nine major classes of organizations. Critics of this research argue that the findings were unusable because of the measure used or the lack of potentially key variables (Carper and Snizek; Hall 1995). Bill McKelvey's research, however, is what Hall called "a major step in the taxonomy direction," (1995). McKelvey's work placed emphasis on the populations of organizations, equating society and organizations as being the same. Additionally, his notion of dominant competence refers to the "technical and managerial knowledge and skills that enable an organization to survive," (McKelvey 1982; Hall 1995).

Research conducted within the field of organizations covers a wide array of topics. Among them are discussions of the nature of bureaucracies within organizations, organizational structure and communications, corporate or organizational culture and organizations and adoption of innovation. All of these elements play a paramount role in establishing how an organization operates

and for the purpose of this paper, each of these elements will be discussed briefly.

Corporate culture is a concept that is crucial to the discussion of the greening of the automotive and building industry as it is the culture of the individual organization or company that will support or negate green efforts. Understanding the fundamental issues within the discussion of corporate culture will lead to less ambiguity in determining the internal and external motivational factors for establishing green practices.

Hofstede (1991) argues that organizational culture is "the collective programming of the mind which distinguishes the members of one organization from another, thus the differences in culture between organizations is largely a function of the managerial practices as perceived by the organizational members," (1991). According to J. Steven Ott, author of *Organizational Cultural Perspective*, there are two definitions of organizational culture:

> "First, [organizational culture] is the culture that exists in an organization....[it is] similar to the culture in a society and consists of such things as shared values, beliefs, assumptions, perceptions, norms artifacts and patterns of behavior. Second, organizational culture is a way of looking at and thinking about behavior of and in organizations, a perspective for understanding what is occurring. [In this context,] organizational culture refers to a collection of theories that attempt to explain and predict how organizations and the people in them act in different circumstances." (Ott 1989)

Ott also states that organizational culture has three general sources. The first source is derived from the greater societal culture the organization inhabits. The second source is the nature of the organization's business. Beliefs, values

and basic assumptions retained by the leaders or dominant figures in the organization are the last source. These sources are directly related to internal and external motivational factors that influence the automobile and building industries. For example the first source, societal culture, is an external factor. An organization will only function as long as it is within the boundaries of the greater society. The last source, the value systems of an organization's leader is an internal factor that dictates how and why an organization operates. It can be argued that leadership is the underlying backbone for an organization's culture. Leadership and societal pressures as internal and external motivational factors respectively will be discussed in subsequent chapters.

C. Diffusion of Innovation

The history of diffusion research is similar to the history of organizational behavior research. According to Everett M. Rogers, exploration on diffusion of innovations started in a series of self -governing intellectual enclaves during its first several decades (1995). In other words, different disciplines would study diffusion specifically within that discipline. But by the mid-1960s, this occurrence began to disappear, as researchers in one discipline began reviewing the work in other disciplines regarding innovation diffusion. Now, diffusion innovation research is considered to be "a more unified cross-disciplinary viewpoint" in which "every diffusion scholar is fully aware of the parallel methodologies and results in the other traditions," (Rogers 1995).

The role of innovation diffusion is critical in the debate of the greening of industry. What is of particular interest is the rate that green technologies are being fostered within organizations, in addition to whether such innovation is supported and encouraged. Both sociological-based and innovation-based studies focus on these concerns. It is necessary to understand the key points within the field of innovation diffusion in order to truly grasp the implications of such innovation within the automotive and building industry.

According to Everett M. Rogers(1995), diffusion is “the process by which an innovation is communicated through certain channels over time among members of a social system." There are several conditions involved with diffusion. Rogers notes four main elements, the first being the innovation itself. “An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption,” (1995). Rogers points out that the concept of ‘newness’ does not just entail the newly acquired knowledge; it may also be thought of as a decision to adopt a practice or product. Second, the “communication channel” or the ways in which messages are communicated, is also an important aspect of diffusion. “The nature of the information-exchange relationship between a pair of individuals determines the conditions under which a source will or will not transmit the innovation to the receiver, and the effect of the transfer,” (1995).

The third element in innovation diffusion is time. Rogers argues that this element is often ignored, but it has serious implications as to the decision-making process of the particular innovation, specifically adoption or rejection.

Finally, the social system impacts the particular innovation. Rogers defines the social system as “a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal,” (1995). The social system serves as a boundary for innovation in addition to regulating the relationships and the process.

> ‘‘The innovation-decision process is a process through which an individual (or other decision-making unit) passes (1) from first knowledge of an innovation, (2) to forming an attitude toward the innovation, (3) to a decision to adopt or reject, (4) to implementation of the new idea, and (5) to information of this decision.” (Roger 1995)

This model, described by Rogers, demonstrates a process that transpires over time. Another aspect of the decision-making process is what is termed the ‘rate of adoption.’ The rate of adoption is the proportionate speed with which members of a social system (1995) adopt an innovation. Additionally, the rate of adoption is explained through five characteristics: relative advantage, compatibility, complexity, trialability and observability, in addition to several other variables. (1995).

Incentives and/or mandates affect the rate of adoption and relative advantage of an innovation as well. According to Rogers, “many change agencies award incentives or subsidies to clients to speed up rate of adoption of innovations, “ (1995). The main utility is to augment the degree of relative advantage of the new idea. Incentives are usually in the form of an direct or indirect cash payment to encourage behavioral change (1995). Mandates for adoption, on the other hand, symbolize a device through which “the system

exerts pressure on the individual to recognize the relative advantage of innovation (Rogers 1995).

D. The Role of Public Policy

The rate of adoption in diffusion innovation can be translated into public policy, particularly how regulations or programs are designed. Similarly to the incentives and mandates under the rate of adoption policies fall under two categories – mandatory and voluntary. For example, policies that are mandatory in nature may elicit a sense of urgency from a particular company, or a business sector (if the policy is targeting the entire sector) to participate. It is important to note that what most inspires an organization to comply with regulations and requirements is the repercussions if they do not participate.

Policies that are voluntary in character may not instill the same sense of seriousness as the mandatory policies. Depending on how munificent the incentives are, a particular organization might find such an opportunity warrants their participation.

Research conducted for this paper highlighted several different policy types that were used in sighting the green trends within the automotive and building industries. Each of the policies that will be discussed in this section falls under one of these classifications. There are three types of policies: regulatory, incentive-based and labeling. The first policy type is regulatory policies. Regulatory policies use the “command-and-control” technique; laws and requirements are prescribed and the industries are required and responsible for

complying with those rules. Governmental agencies, such as the EPA and industrial leaders usually designate these kinds of polices. Regulatory policies are mandatory in nature, thus organizations are it is necessary to adhere to the requirements.

Some policies are voluntary and do not require mandatory participation. These programs are incentive-based and usually offer some type of monetary reward or discount for participation, such as a subsidy or tax break, respectively. Incentives also come in the form of being allowed to do something in particular. An example would be members of a program being given credits to pollute after the organization had reduced their pollution by a certain amount. An organization might be inspired to participate in incentive-based programs for a number of reasons as outlined by Videras and Alberini (2000).

Labeling policies are polices that attach a label to the organization. Policies under this category may be categorized as being either mandatory or voluntary. For example, an organization, depending on the sector and regulation laws, may either be mandated to, or voluntarily expose their production processes and products for evaluations or classification. Labeling policies, when they are voluntary in nature, have a similar effect on organizations as voluntary incentive-based programs. The publicity and the perceived competitive advantage of being listed under a particular label are enticing to some organizations, especially those looking to improve their market share value and their customer base. If, however, labeling policies were mandated, organizations would strive to achieve the proper status under the labeling system in order to

avoid persecution as well as to increase their profit maximization. The following two sections examines the type of public policy initiatives that are currently active in the automobile and building sectors.

1. Examples of Public Policy's Impact on the Automotive Industry

Regulatory policies can hit the industry in a variety of places. Regulations can dictate the specific environmental goals, target technologies and even require certain processes and steps are taken during the production of their product. Governmental agencies can demand that automakers install specific technology within their car that will help it to perform better with less of an impact on the environment. In 2000, the EPA proposed a rule that called for drastic cutback of the sulfur content of diesel fuel added by U.S. truckers (*Chemical Market Reporter* 2000). States such as Maryland, Vermont, Maine, Massachusetts, Rhode Island, New York and New Jersey set up pilot programs to begin testing (Moore 1999).

As stated earlier, governmental agencies are not the only organizations that can implement policies. Ford initiated an in-house policy within the last few years that demanded its suppliers be ISO14001 certified Buchholtz, 1999; Obubela, 1999). The ISO14001 certification serves as a label policy in itself, as businesses with the ISO14001 'label' may improve their market share and overall public image.

Governmental regulations aiming specifically at the corporate average fuel economy (CAFE). Automakers resolutely oppose any further increases as, they argue, "it would raise production costs, increase the price of their cars to consumers and lower total sales.." Dunn 1999). Recognizing the need for their

cooperation, industry leaders and government officials have struck a deal. “In return for less punitive and more flexible regulations, they would be willing to offer some cooperation,” (1999). Automakers, such as Ford, GM and Toyota, have already announced the production of low-emissions vehicles in lieu of receiving guarantees that “other states would not follow California’s lead and demand zero-emission vehicles,” (1999).

Dunn argues that Congress must use both ‘carrots’ and ‘sticks’ when dealing with the industry. “If the stick is higher federal fuel economy standards, the carrot must be flexible in meeting the standards and perhaps a chance to participate in designing the new regulations,” (1999). This is a major incentive for the automotive company, as it not only gets the opportunity to save money, it will have another opportunity to tailor a law to its liking.

The EPA has also adopted several incentive-based voluntary programs, which focus on emission reductions of the automobile with the help of state governments. The EPA monitors the state’s progress through the State Implementation Plans (SIP) (Cummings & Walker 2000). In addition, the EPA adopted several policies which would allow “states to claim credits in their SIPs if they can demonstrate reductions in harmful emissions resulting from voluntary mobile source emission reduction program,” (2000).

There have been several states, which began and have implemented these programs, such as The Clean Air Campaign in Washington, DC and the Ozone Alert Day Action program in Dallas/Fort Worth. As apart of the program, state officials must educate the public about the ozone layer and influence

consumers on the importance of car-pooling and mass transit (Cummings & Walker 2000).

Tax breaks or tax incentives also falls under this category. For example, environmental taxes could be used to "finance offsetting reductions in other taxes," (Miranda & Muzondo 1991). Another example of a cost-saving incentive is the design of green payment programs to reduce nonpoint pollution sources (Horan et.al. 1999).

Labeling policy puts organizations into categories based on their environmental performance through either their processes or their products. ISO14001 certification is a type of labeling policy. Additional labeling policies include initiatives to create a green certification list for the vehicles themselves. One such list is being sponsored by the ACEEE (*Electric Vehicle Online Today,* 2000*)*. These policies for the automobile industry are currently on a voluntary basis. Environmentalists hope that such policies gain main stream acceptance to the point where they will be mandatory.

2. Examples of Public Policy's Impact on the Building Industry

Regulatory policies in the building industry are represented in several ways. Building codes dictate the specific requirements needed for a building. The codes are mostly designated by the locality in which the building will be located, however, 17 states have adopted statewide codes (Goetzl & McKeever 1999). Green methods and materials can show up in the building codes and help to ensue the fact that the building is being constructed in an environmentally and ecologically friendly manner. Batter Park City Authority has a mandatory

clause in the building codes which state that the next nine high-rises to be built must be done using green methods and technology, in addition to employing efficiency measures (*ENR* 2000).

The EPA has established several incentive-based voluntary programs, including the Energy Star Buildings and Green Lights Programs. According to the EPA, as of May 1997, more than “2300 companies, nonprofit groups, academic institutions and state and local governments have signed up to participate “ in these programs (Dolin 1997). The New York State law, the Green Buildings Tax Credit, is another example of an incentive policy. It influences industry members to participate in green building by providing a tax credit (Post 2000).

The government provides incentives for builders who renovate brownfields by protecting them from any incurred clean-up costs after a certain point (Lurz 2001). In addition, builders are given protection from any pending lawsuits regarding the pollution on the site they are reconstructing.

On the industry level, Fannie Mae and the NAHB have sponsored a ‘green’ mortgage program, in which six pilot cities work with the HBAs and the Fannie Mae partnership to come up with more efficient ways to use resources (Bady 1999).

The LEED Residential or Commercial rating is an example of a voluntary labeling policy (Stromberg, 2000; O’Toole 2000; *Professional Builder,* 2000). As with the rating systems in the automobile industry, environmentalists want rating systems to become mandatory. Because of the decentralized character of the building industry, creating a uniform ratings certification system is a formidable

task. However, the advocates claim the U.S. Green Building Council is working to pass an industry -wide that will receive the support of federal and local governments (Barnett, 2000; Stromberg, 2000; Crowley, 2000).

E. Putting Organizational Theory, Diffusion of Innovation and the Role of Public Policy in a Green Perspective

It is important to look at organizational and innovation theory through 'green' eyes. As stated earlier, organizational theory and diffusion of innovation theories will help in understanding the processes behind the trends and motivational factors within the automobile and building industries, as well as governmental adoption of green policies. Some of the theories presented in the earlier discussions are clearly noticeable in the automobile and building industries. For example, corporate culture is a fundamental aspect regarding the internal factors that will lead the automotive and building industries into adopting greener practices, methods, and technologies.

The corporate culture within a firm dictates the firm's sensitivity to environmental issues (Videras & Alberini, 2000; Winn, 1995; Henriques & Sardosky, 1996). Ott identified these sources of corporate culture as the greater societal culture within the organization; the nature of the organization's business; and the basic beliefs, values and assumption of the organization's leaders. Part of the reason industry is turning to green practices is because consumers, environmentalists and politicians have stressed the importance of reducing pollution. The nature of automobile and building companies is to make money.

This is representative of the second source of organizational culture. As some of the internal motivational factors will prove, companies are concerned about their performance in the market. Most often, a company will not be profitable if its market value decreases. As consumers demand more and more green products, companies must be able to respond to meet those needs in order to maintain a good market standing.

The last source of corporate culture is the belief system of the leaders of industry. Some of the top industry leaders within the automotive sector, such as Ford and General Motors, have announced their companies' move to obtain and use green methods and technology. These leaders believe that green technology and methods should be important aspect of their business and their apparent attitudes go a long way in shaping the overall culture of their perspective companies. Leadership is arguably the most important element within corporate culture. For the purpose of this research, leadership qualifies as an internal motivational factor, as leaders of a given organization dictate the overall corporate culture.

Incentives and mandates help to speed up the rate of adoption. Companies in the automobile and building sectors are lining up to join green programs that will give them a certain amount of money to institute green practices over time. In the building industry, for example, the Fannie Mae Foundation is offering $100 million to investors who nurture green building efforts and come up with solutions to environmental problems. Mandates also inspire a quick rate of adoption, but for different reasons than incentives. Mandates are

essentially forcing the quick adoption of an idea, so the company can avoid persecution. For example, California mandates that by 2003, 10 percent of vehicles sold must be emission-free (Rogers, 1999; *Purchasing* 1992).

Advocates of the green building movement suggest that the foremost method for instituting green practices is through public policy. Public policy plays a critical role in the establishment of any green initiative. Public policy can take on many different roles and shapes. The regulations that dictate what can and can not be done; the rules and requirements that both auto makers and builders must adhere to; the adoption of ISO14001 certification and other rating systems - all are routed within public policy. For example, there are initiatives such as giving incentives to builders who renovate brownfields (Cave, 2000) or stimulating green technology innovation through policy (Norberg-Bohm, 1999).

Public policy is often the middle ground between the industry and the public. Environmentalists and the lay public look to public policy to address key environmental issues. While the auto industry would like the regulations to decrease or stop all together, environmentalists are now, more than ever, calling for stricter policies to regulate industry.

An answer to heavy regulations was the voluntary environmental programs. “In the early 1990s, the EPA initiated an alternative approach to environmental regulations based on voluntary pollution prevention programs,” (Videras & Alberini 2000). But as they point out, only certain organizations take advantage of the voluntary programs. There is still a need for regulators to focus

on those organizations that are not taking steps toward environmentally –friendly practices.

Another issue within the green movement is the demand for green products. The current demand for green automobiles and buildings is low. Part of that stems from the fact that consumers do not know about the green options that are available to them. Another reason that there is no public demand for green goods is cost. Often times, the up front cost of green products is staggering, however it is important to note that these initial costs are recouped and some green products have been proved to be superior and more sufficient than traditional products. That is where the policy influence comes most into play. Policy can dictate how much money can be spent on researching these new technologies. As it is the case with Fannie Mae for the building industry and the Big 3 and the U.S. or Canadian government for the auto industry, policies often have stipulations that allow such research to receive funding.

Public policies instituted by the government, non-government, green organizations or by industry leaders, have a significant impact on a given industry. The relationship is also reciprocal in nature. Policies are not just set by the government. Industry leaders, green organizations and consumers all play a role in influencing policy trends. For example, in Tunisia, the government has taken a pragmatic approach in terms of the environment (*African Business* 1999). The Tunisian government instituted an environmental policy that included essentially everyone's opinion. The results: over 55 sewage treatment plants currently in operation and the goal of 100 the end of 2001(1999). In addition to

getting everyone involved, the government holds regular press conferences "keeping the public informed about what [their] actions are all about," (1999).

A study of the environmental attitudes and behavior of consumers in China suggested that while consumers cared about the environment, they exhibited no real commitment to purchasing green products (Chan 1999). In order to reverse this phenomena, Chan recommended that the government and green markers should consider ways to "raise Chinese people's existing ecological concerns and channel them into actual commitments," (1999). McGougall (1993) suggests that the green movement is essentially consumer driven.

Some policy experts suggest a change in taxation methods (Woehlke 2000). This is evident in the case of New York's Tax Credit law for the tenants and landlords of green buildings. Other policies may focus on designing green payment programs to reduce nonpoint pollution, given voluntary participation and equity considerations (Horan et. al. 1999).

Critics argue that most federal policies aimed at environmental laws and policies are extremely confusing and thus nearly ineffective in terms of compliance (Moore 1999). There needs to be a clarification of what the environmental laws are attempting to accomplish.

As demonstrated by the examples, public policy exhausts its influence in many different ways. While some would argue that public policy is not the only way to bring about environmental change, most would agree that it plays a significant role. Public policy can dictate, implement and monitor industry's

compliance. It can also be argued that the most effective way to bring about environmental change is to use different types of public policies at the same time. ‘Command-and-control’ strategies work best as a last line defense, with voluntary programs being the first line. However, strict regulations are needed in order to keep the structure of the goal in mind. Public policy initiatives should be re-evaluated frequently to make sure that they have not lost sight of the initial goal.

III.

Trends and Motivational Factors in the Automotive Industry

This research created an extensive database, listing all of the obvious and latent green actions and the reasons for those actions within the automotive industry (Appendix 1). Analysis of this database revealed that there were several trends that seemed prevalent throughout the literature, which was then applied to a general matrix (Appendix 3). Those occurrences led to a designation of several key trends, to which all of the green activities in the automotive industry could be linked. Each trend fell into one or more of the following categories: product, process and supply chain.

The final analysis of the literature, trends and motivational factors led to the creation of the final matrix shown by Table 1.

Table 1: Base Matrix for Trends and Motivational Factors

Industry	Trends	Motivational Factors	
		Internal	External
Product			
Process			
Supply Chain			

Trends and internal and external motivational factors were classified by product, process or supply chain. Each motivational factor was examined from the industry's perspective. The following sections will describe the trends and

motivational factors that fall under each category, using Table 1 as a model for analysis.

A. Product Trends and Motivational Factors

Table 2: Automotive Product Trends and Motivational Factors

automotive	Trends	Motivational Factors	
		Internal	External
Product	voluntary 'green' programs/actions	perceived competitive advantage; dedicated leadership	market advantage & pressure; potential & future regulatory pressure;
	development and use of green rating system	perceived profit maximization; dedicated leadership	market pressure; also regulatory pressure
	developing new technology	perceived market and profit maximization; perceived competitive advantage; perceived public relations	market pressure; regulatory pressure
	compliance with product regulations	regulatory compliance and relief;	market pressure; organizational pressure; regulatory pressure; social pressure

Table 2 depicts the four main trends and related internal and external motivational factors that take place within the product category. The first trend is the increase in voluntary green programs, sponsored by either governmental or non-governmental agencies, in addition to the industry itself, that inspire members of the building industry to participate. Ford Motor Company's acknowledgment of how much their sport utility vehicles contribute to the greenhouse gasses and the overall environmental degradation was a step that some may argue Ford did not necessarily have to take. In their Corporate Citizenship Report, this information was revealed voluntarily, even though the countless studies have proved that the SUV is an environmental hazard. In

addition to setting aside “decades of the auto industry’s denial about the nasty side effects of its vehicles,” Ford publicly and voluntarily “raised the bar” by announcing their green intentions with SUVs (*Business Week* 2000). According to *Chemical Week*, Ford claims that it will expand its SUVs’ fuel efficiency 25 percent by 2006 (2000).

Ford isn’t the only motor company voluntarily announcing its intentions on creating more green and efficient products. DaimlerChrysler Corporation, General Motors (GM), Toyota, Honda and BMW are just some of the automotive companies to have made such claims. BMW has instituted a program called Fully Integrated Road Safety Technology (FIRST) under which the company plans to institute more advanced green technology beyond what the regulatory standards have put in place. Toyota has instituted a program called the ECO project, which was launched in 1996. In this project, Toyota engineers study and research all types of technologies in order to create a greener vehicle (*Business Week* 2000).

The Department of Energy and the Big 3 (GM, Ford and Chrysler) are involved with a program called the Partnership for a New Generation of Vehicles. This partnership is an example of a volunteer program between the government and the members of the automobile industry. This program, however, has been the subject of controversy regarding its effectiveness. Opponents argue that the DOE and the Big 3 union is “corporate welfare,” while supporters claim that it “stimulates creative thinking among automotive engineers,” (Hileman 2000).

One of the internal motivational factor is perceived competitive advantage. In a society where environmental impact of automobiles is increasingly becoming a concern of the average consumer, gaining an edge on the competition is critical. It is also important to note that once Ford made is green promise, other companies (namely GM and DaimlerChrysler) were quick to follow suit.

Another significant internal factor is the changing of leadership. In the previous chapter the corporate/organizational culture concept was defined as "the collective programming of the mind which distinguishes the members of one organization from another," (Hofstede 1991). This concept refers to a company's (or even an industry's) frame of mind -- it's way of doing things and norms of what is and is not accepted as the norm. Ford's Corporate Citizenship Report and their claim on improving the environmental impact of their SUVs are examples of how the organization's mind frame is changing. While it can be argued that the only reason Ford made that announcement was for publicity and to ultimately increase sales and profits, a change in the mind frame of what is and is not important is necessary in order to bring about an adjustment of the product itself.

Perceived competitive advantage as an internal motivational factor can correspondingly be translated into a market advantage or pressure. However, the market exists also as an external motivational factor. Automobile companies, not unlike other companies in different industries, are very much influenced by the market. One of the main reasons the SUV is currently in such high demand is because the desire of consumers to have big powerful cars. Yet,

environmentalists and supporters of the green movement argue that consumers are becoming better educated and more aware about the benefits of green vehicles and their environmental impact. Automakers want to prepare themselves for these change with enough time to develop the technology and advertise that they have it.

Future and impeding regulatory pressure is another key external motivational factor. Automakers are currently required to meet standards imposed on them by the government. But future regulations can potentially be stricter and impact the product in ways that the previous standards had not. Companies who participate in voluntary green programs and make voluntary actions are trying to lessen the potential regulatory blow in advance, in addition to positioning themselves for a future green market. Developing the technology and coming up with cost-effective ways to do it before government imposes mandatory regulations may have a serious impact on a company's outlook.

The development and use of a 'green' automobile rating system is a relatively new trend which environmentalists hope will snowball in popularity. The EPA has established a rating system which would "rate each new car and light truck for its impact on the environment," (Stoffer, 2000). Evaluations would be based on fuel economy and tailpipe admissions and the award scale would be from one to five stars, one being the lowest and five the highest. Ratings will be based on the car's performance in the two categories.

The American Council for an Energy Efficient Economy (ACEEE) has a similar certification/rating system in place. The EPA's rating initiative and the

ACEEE's green list are inspired by the popularity of the crash test ratings. Both organizations hope that a green rating system will become just as popular.
In February 2000, the ACEEE published their list of the greenest vehicles with GM's EV1 and Nissan Motor Company's Altra EV at the top of the list. Not surprisingly, GM's Chevy Suburban and Ford's Excursion were named the "meanest or the most polluting vehicles," (*Electric Vehicle Online Today,* 2000*)*.

As with the voluntary green programs and actions, an internal motivational factor for a rating system is the dedicated leadership. Leadership in an automobile organization may now be placing a high priority on developing a green vehicle. The perceived profit maximization, is arguably, the most significant internal factor represented within this trend. Profit maximization is the organization's discernment of market demand as it translates into either investments or future profits gained or lost. In this case, auto companies can potentially lose money if their vehicle isn't under the 'greenest' category or if their vehicle does not receive the acceptable amount of stars.

Regulatory and market pressures serve as external motivational factors for this trend, as both regulatory standards and market demand can potentially begin to rely on these rating/certification systems as a means of adhering to guidelines and serving the customer's needs.

When an individual thinks of product trends, one of the first things that comes to mind is the development of new technology. Such technology specifically deals with the product itself, meaning there is something in the vehicle's diagnostic or operating system that reduces that vehicle's impact on the

environment. For example, the diesel engine, hybrid powertrains and alternative materials, in addition to smaller more efficient engines, are just some of the technologies that have gained ground within the automotive industry (Hawken et. al., 1999).

Many of the big car manufacturers have announced new technologies being installed in vehicles. GM revealed plans to produce the EV1, a two-seat, electric coupe that is currently sold in only Arizona and California (Jewett 1998). Nickel-metal hybrid batteries and a 1.0-liter engine that operates on compressed natural gas with a 160-mile range (1998) power this vehicle. Ford plans to release its P2000, a car that, according to Jewett, will be an “evolutionary step toward the 80-mpg mid-sized car,” (1998). It has an aluminum four-cylinder 1.2-liter direct-injection through bolt assembly compression ignition engine that can function on diesel fuel or methanol. In Ford’s proposal to reduce SUV’s environmental impact by 25 percent, 70 percent of “those efficiency measures will be achieved by using unspecified and material technologies to reduce fuel use and its weight,” (*Chemical Week* 2000). In addition, Ford claims that “SUV’s will meet the low-emission standards set by federal guidelines,” (Ogando 2000).

DaimlerChrysler has begun working on a way to use a miniature substrate to replace the larger canned substrate in the exhaust manifold. The company has also studied ways to incorporate a loss-air-gap technology, which “uses two layers of stainless steel with an air gap to boost catalyst efficiency,” (Sorge 2000). The Dodge PowerBox, a hybrid concept, is a new product that DaimlerChrysler announced in 2001. The PowerBox will be equipped with a

"supercharged 2.7 liter V-6" that functions on compressed natural gas and an electric motor (*Automotive News* 2001).

The Partnership for a New Generation of Vehicles, a joint federal government and Big 3 venture, is currently developing a prototype mid-sized sedan with 80 mpg to be ready by 2003 (Jewett 1998).

But U.S. manufacturers are not the only automakers to announce their new green vehicles. In fact, some car manufacturers overseas, particularly the Japanese manufacturers, have been in the 'green' business for quite some time and, as some would argue, more advanced than their American and even European competitors. For example, Nissan has developed a vehicle called the Stylish 6, a "large hybrid utility wagon," (Treece 1997). In addition, Nissan has developed a pure electric car that is sold only in California called the R'nessa EV. Nissan focused on alternative powertrains in categories such as the direct-injection engine, hybrid powertrains and longer-term fuel cell vehicles (Treece 1997).

Toyota Motor Corporate was the first company to launch a fuel-sipping hybrid car (*Automotive* News 1999). The company created the Pirus, in which there is a parallel hybrid system. According to Hiroyuki Watanabe, managing director of Toyota Motor Corporation, one of their chief priorities is reducing CO_2 emissions. Their ECO project examines technologies such as lean-burning fuel, natural gas, electric cars, hybrids and fuel cells. Toyota also claims to have innovated direct-injection technologies in order to cultivate power and decrease emissions.

Honda Motor Company announced in 1999 that they planned to replace the entire automobile engine line up with new, more environmentally friendly engines by 2005 (Treece 1999). Honda claims the new engines will be more "fuel efficient by 25 percent and will reduce hydrocarbon exhaust emissions by 75 percent," (1999). These percentage reductions will be applied to cars, motorcycles and other power products as well.

European car makers such as BMW and Mercedes-Benz are also in the process of developing new technologically and environmentally friendly vehicles. BMW was the first manufacturer to create a three-way closed-loop catalyst motorcycle. The company also boasts that it is the "only car maker that has improved consistently its corporate average fuel economy since employing advanced technologies," (Ziwica 1995).

Mercedes-Benz, in 1997, announced that it was going to create a fuel-cell car that would be commercially feasible in eight years. This car, named the Necar 3, is based on the A class. It fills up with methanol, which is then converted to hydrogen. The hydrogen reacts with the oxygen and generates electricity, thus powering the car.

There are several internal motivational factors associated with the new technology trend (Table 2). First of all, the perceived competitive advantage is a major driver for the development of new and creative technology. It can be argued that the auto manufacturers are essentially trying to beat their competition to the punch. Despite Japan's early lead in the green race, the game is still young, thus giving hope to other manufacturers, such as GM, Ford,

Mercedes and Honda. The competitive advantage factor leads right into the next internal motivational factor – positive public relations. Companies are advertising to the consumers regarding their green achievements by demonstrating that they are making these adjustments and developing new technology. A possible outcome of such advertisement is that consumers may begin to look at green vehicles as something they want. Consumers influence the market, and this outcome is directly related to the next internal motivational factor, perceived market pressure.

Essentially, the auto manufacturers are attempting to position themselves for when the market becomes green based. By developing the technology now, they guarantee themselves the opportunity to make profits at a higher rate, than if they began implementing green technology when the consumers actually began demanding it.

Perceived profit maximization is a major internal factor that is generating the drive for new technology. Under this perspective, companies are strictly looking at how to increase future profits. If companies develop the technology before the demand for green vehicles becomes popular, they will be able to prepare for the costs and develop ways of recouping the cost of conducting research. Profit maximization would not be emphasized if companies began developing the technology as the market or the government demanded from them.

Just as the market is an internal factor, it is an external factor as well. The market often shapes how corporations respond and if the market demands

green, corporations must comply. In the same token, regulatory pressure has the same hold over corporations as the market. The government may require all vehicles produced past a certain point have a green component in them to reduce their environmental impact. Auto manufacturers would either have to respond by putting green technologies into place or pay a hefty fine or penalty for not complying. It is important to note that there is a distinct difference between perceived market or regulatory pressure and market or regulatory pressure, respectively. The main difference is that organizations often view the potential effects of the market and regulations, without these changes even taking place. The phrase market pressure or regulatory pressure deals specifically with what is actually occurring.

The final trend that will be discussed under the product category is the development of product regulations. The United States has been a world leader in the category of "technology-forcing automobile regulations" (Dunn 1999). The EPA and other federal and state governmental agencies currently have hundreds of laws that aim at reducing the environmental impact of automobiles. Most of these laws target emissions, other air pollutants and fuel efficiency. In 1992, California passed a law that required two percent of all new cars sold in the state to have zero emissions. This percentage increased in 2001 to five percent and it will increase to 10 percent by 2003 (*Purchasing* 1992). Twelve northeastern states used California as a model in implementing similar laws. According to *Purchasing*, if those twelve states did pass similar laws, "more than a third of the

car and light-truck market will be affected by these so called green-car laws," (1992).

However there is a surge of regulatory statutes being passed across the country that focus on other aspects of green vehicles. For example, the government is considering targeting the use of mercury in automobile steel and switches. According to the Ecology Center in Ann Arbor, Michigan, the Great Lakes United and the University of Tennessee's Center for Clean Products and Clean Technologies conducted research and revealed that 15.6 metric tons of mercury were being released ever year when contaminated steel from scrap vehicles is melted (*Manufacturing News* 2001*).* The study also argued that mercury is unnecessarily used and that the automotive industry is the largest source for mercury pollution. New regulations may either reduce mercury usage or completely ban it from being used.

Not all regulations impose standards on manufacturers. A recently implemented law in California allows drivers of all-electric, natural gas or hybrid vehicles with no emissions to travel in the High Occupancy Vehicle (HOV) lanes. This law is aiming at the manufacturer through the consumer, in that it is enticing the consumer with an incentive to purchase green vehicles, which in turn, translates to the number of green vehicles that are produced.

Regulatory compliance and relief are two of the main internal motivational factors under product regulations. Automakers are concerned with being able to meet the provisions set forth under the regulations, both financially and operationally. On one hand, industry leaders are apprehensive about the amount

of money it is going to cost them in order to comply (or not comply) with these standards; on the other hand, they are worried about whether their corporate infrastructure (the employees, how the company does business day-to-day) can handle the changes.

External motivational factors include market, organizational, social and regulatory pressures. If it became publicly known that a particular organization was not meeting federal standards, their market share may be damaged. Environmental organizations pressure industry either directly or through lobbying for legislation. The greater society may even begin to demand that all automakers must comply with product regulations and anything less would be socially unacceptable. Even though the industry is concerned with complying with new regulations, the actual regulation itself may impose a threat on the manufacturer and its products.

B. Process Trends and Motivational Factors

Table 3 shows the trends and motivational factors within the process category. The development of cost-saving green action programs and technology is one of the trends that falls under the process category. Within the automobile industry, as it is within other industries, any new implementation or development takes time and money. Especially in the case of the development of new technology, money is needed to fund research and experiments in addition to getting materials and equipment. Many corporations may be skeptical

of change due the cost. Programs that target manufacturer's desire to save money serve as an incentive for them to improve their products environmentally.

Table 3: Automotive Process Trends and Motivational Factors

automotive		Motivational Factors	
	Trends	Internal	External
Process	cost-saving 'green' action programs and technology	perceived profit maximization; new technology development	governmental regulation & market pressures
	renovation of old existing factories	dedicated leadership; perceived public relations	market pressures, regulatory pressure
	adoption of ISO14001 standards	market pressure & dedicated leadership; perceived competitive advantage	market and regulatory pressure; social pressure
	compliance with process regulations	regulatory compliance and relief; profit maximization; perceived public relations	regulations pressure; market pressure; social pressure
	voluntary action programs in conjunction w/ governmental	competitive advantage; dedicated leadership	financial pressure; governmental regulations; market pressure

Incentive programs aim at manufacturing production and operational costs. Advocates of green industry argue that environmentally-friendly products, processes and materials can go a long way in saving the organization money. Before the DaimlerChrysler merger, the Chrysler Corporation began an initiative to use a lead-free paint on its SUV, the Dodge Durango, in 1997. The initial

research revealed that the cost of lead free paint would be 10 percent more than lead paint (Chappell, 1997; English, 1999). However, the company soon realized that the high up-front costs would translate to bigger savings down the road, as the cost of filtering the lead paint would be eliminated. “As a result Chrysler saved around $140,000 a year painting the Durango,” (1997).

Chrysler is not the only company reporting similar savings. 3M Automotive found that by spending money to discharge solvents from one of its production materials, it avoided the cost of buying chimney filters to collect emissions after the fact (Chappell 1997).

An example of cost-saving technology is a mechanism called the High-Volume low-pressure spray gun. According to the EPA, this spray gun is extremely environmentally friendly and cost effective because it first reduces the release of toxic chemicals that go into the air; and second, it decreases the amount of paint needed (http://www.epa.gov). The HVLP spray gun is currently being marketed to the industry and auto paint shops across the country.

According to Bruce Reid, director of GM Canada’s Office of the Environment, “adopting pollution-prevention techniques [will allow the] industry [to] reduce waste and cut costs,” (English 1999). These costs can be hidden by financial inquiries and many cost-saving techniques will not always be immediately evident. But Reid argued that there needs to be a genuine attempt to identify these cost-cutting opportunities.

Jaguar has installed what is called a CHP unit that will furnish nearly 50 percent of a manufacturing site’s electricity requirements and reduce the boiler

temperature by one half. This chip will cost Jaguar less for electricity and let the facilities recover waste heat. In other words, Jaguar will save money on their heating and hot water bills (*Energy & Environmental Management,* 2000). This chip is currently installed in two of Jaguar's production facilities.

Just as with the Durango, manufacturers have to look at the big picture in order to save money. This internal motivational factor is what is in the mind of most of the executives of these manufacturing companies. It is the perceived profit maximization future costs verses operational costs that is a critical motivation.

The opportunity to develop new technology is also an internal motivational factor. Using technology such as the HVLP spray gun, can save an organization money, and, at the same time, give them potential patent opportunities and an advantage of their competition.

Market and governmental regulations also apply demands on manufacturers. Werner Pollman, DaimlerChrysler's chief environmental office said it best in an *Automotive News* article: "A lot of people are asking for environmentally friendly cars, but nobody is prepared to pay money for this and therefore, I think it's a challenge for the engineers to fulfill both items," (Kisiel, 1999). The challenge is for engineers to come up with environmentally friendly technology without making the consumer pay higher costs. If consumers are forced to pay more, a majority of the public will not buy the product. At the same time, government regulations may come in and set environmental mandates that such technology be put in place, regardless of market demand. Automakers can

end up losing money. Therefore, green advocates argue, it is better for companies to begin developing these programs and technologies now, in order to offset high costs.

The renovation of old existing factories represents another trend that is demonstrated by several manufactures in the United States, particularly those with plants located in the greater Detroit, Michigan area. In November 2000, Ford announced its plans to renovate the Dearborn Truck Assembly Plant in Dearborn, Michigan, a $2 billion renovation project (Stoll, 2001). Ford's goal is to "transform a sprawling and antiquated brownfield site into an ecologically and worker-friendly complex," (2001). The renovation will focus on implementing new technology to reduce the waste and pollution accrued during the production process. Some of the proposed plans included a new system for managing contaminated rainfall; building an "ecologically inspired roof" with assorted foliage and grasses; repaving the parking lots with a porous material which will filtrate water through retention beds; include solar and fuel cells to power computers and other equipment; and create a new paint shop that will diminish emissions through the use of water-based primers and base-coat paints (Stoll, 2001).

In Lansing, Michigan, GM has followed suit and declared it will reopen an old plant in December 2001. Like Ford, GM boasts that the renovation of this Lansing site will serve as a "blueprint to industry leaders on how to build and operate an environmentally responsible manufacturing facility," (*American Metal Market* 2000). The renovated site will house a new body shop, paint shop and

general assembly facility and will employ “lean manufacturing.” GM also proposed to develop a system to catch and treat rainwater before it is discharged, in addition to use of lead-free water-based paint. This site will produce the Cadillac Catera and other luxury vehicles. GM asserts that the renovation will recover and recycle many of the original building’s component materials, which equates to “20,705 tons of steel, 145 tons of cast iron, 875 tons of copper, 60 tons of stainless steel and 35 tons of aluminum,” (2000).

The most significant internal motivational factor represented in the renovation of existing facilities is a change in leadership. It can be argued that some manufacturers are beginning to view the environmental impact of their products, especially how they are produced, as an important issue. A company can not create a green product with a “brown” process - which defeats the purpose. Renovation of an original production site not only illustrates that companies want to abate the impact of their production processes, but also aids the surrounding community in its development.

While industry leaders would argue that the internal motivation factor is ultimately employing such environmentally-friendly measures purely out of the goodness of their hearts, critics of the industry may argue that another internal motivational factor is the positive public relations the corporate will receive as a result of their actions. As previously mentioned, the renovation of old sites assists the surrounding community and advances its economic well being. This, in addition to standing favorably in the eyes of the local, state and federal

governments, is the desired effect. It can also be argued that the more expensive the renovations are, the better the organizational looks.

Market and regulatory pressures are the two factors that influence corporations externally (Table 3). The positive public relations help the manufacturers increase their market viability, but regulatory standards may be requiring manufacturers to make these changes anyway. Renovation is also a preemptive move to beat out such standards that may come in the future.

Adoption of International Standards Organization (ISO) 14001 aimed at the production process is a relatively up and coming trend. ISO14001 is an environmental management system (EMS) which establishes standards for companies to follow in order to improve its environmental impact. Several manufacturers such as Ford, GM, Volvo and Toyota have declared their intentions toward using ISO14001. Ford claims to be the first and only automotive company to certify all of its manufacturing plants worldwide under ISO14001 (Buchholz 1999). According to Buchholz, “140 plants, including those of Jaguar and Visteon, in 26 countries were certified to the international environmental standard following independent auditory evaluations by the end of 1999,” (1999; Obubela 1999). Ford began taking ISO14001 as a priority in 1995. “The main reason we’re ahead of the pack with ISO14001 is because we have a global perspective as a company and this is a program that makes sense globally,” said Tim O’Brien, director of Ford’s Environmental Quality Office in an *Automotive Engineering International* article (Buchholz 1999).

Ford is not the only corporation to use ISO14001. GM, Volvo and several Japanese manufacturers, such as Toyota, have also implemented ISO14001 in numerous sites. DaimlerChrysler began institution ISO14001 in their US sites around 1999.

To many, the promotion of ISO14001 standards is a clear indication that the automotive industry is serious about reducing the environmental harm of their products. This represents a change of leadership, a change in the mind-frame of the auto industry in general. Additionally, the perceived competitive advantage and perceived market pressure plays a significant role in inspiring corporations to use ISO14001. It can be argued that no one in the auto industry wants to be left out in terms of taking advantage of the latest trends.

Market and regulatory pressures are also external motivational factors connected to this trend. As it becomes more and more socially acceptable to practice environmentally safe methods, society at large may hold companies to the same environmental expectations as everyone else. This, in turn, reflects upon market demands. ISO14001 may even be used as a selling point, thus increasing a company's market value. With regards to regulatory pressure, the government may require that ISO14001 certification be mandatory for all auto manufacturers. By adopting policies such as ISO14001, corporations are essentially beating the government to the punch.

The development of process regulations is the fourth trend under the process category. Governmental or non-governmental agencies and sometimes the corporation itself can enforce process regulations. For example, BMW has

begun a corporation wide recycling regulation during the design and development process of their vehicles. Volvo Cars of North America, Inc. began a dealer-training referendum in 1999. As a part of their training, dealers are required to include the environment and Volvo's improvements in that area in their sales pitch (*Automotive News,* 1998). Toyota's Earth Charger program, established in 1992, requires that its suppliers and Toyota itself be an environmental leader in terms of products and processes by using in-house regulations that dictate chemicals and materials to use (Jusko, 2000).

Federal, state and even local governments across the country have implemented regulations that have significantly impacted the auto industry and its products. For example, there are new environmental standards in the works that may require automakers to install another catalytic converter to their exhaust emission systems (Sorge, 2000).

The main internal motivational factor with this trend is regulatory compliance and relief (Table 3). Corporations are concerned with following the guidelines and regulations set for them to follow. Corporations are also concerned about any possible relief they can receive from meeting those requirements and the cost of complying with new regulations. At the same time, external factors such as regulatory pressure, is enough of an influencing factor to promote compliance.

The final trend within the process category involves voluntary action programs. Often, the members of industry and the federal, state or local government come together to form partnerships with common goals to establish

new ways and new technologies to develop green vehicles. For example, the Big 3 (Ford, GM and DaimlerChrysler) and the U.S. federal government joined forces to create the Partnership for a New Generation of Vehicles (Jewett 1998). Not only does this consortium examine the ways in which the vehicle production process can be improved, but they also work on developing new product technology.

The Big 3 and the Canadian government have a similar partnership called the Canadian Automobile Manufacturing Pollution Prevention Project. The objective of this alliance is to break down the competitiveness between the car manufacturers in order to share information and create the best available technology to improve the environmental impact of vehicles. Members of this consortium argue that despite the sharing of information, competitive advantage can still be attained and perpetuated; in fact, they argue, the sharing of information will actually enhance competitiveness. The Big 3 and Canadian government also plan to explore new technology to refine the manufacturing process. Supporters of this project claim that such a “voluntary program augments the traditional legislative approach provides significant environmental benefits,” (English 1999).

The union between the Big 3 and the Canadian government’s outlook on competition is the perfect example of the perceived competitive advantage (Table 3). Some may argue that an alliance with the government automatically leads to success. Such a relationship gives an organization access to information, technology and resources that competitors do not have. Another

internal factor is public relations -- advertising a governmental/industry relationship looks good to the lay public and increases the company's marketability. The main internal driver for this trend is profit maximization, represented by profit maximization. Automobile companies are in the business of making money and with a government partnership that has the potential to increase their future profits.

Emerging regulations, social and market pressure are the outside influences on the automakers. Corporations may also be either shielded form emerging regulations or forewarned that to prepare to meet those regulations. With regards to market and social pressure, corporations are concerned about their bottom-line. Having such a partnership advertised may help their public image, thus increasing their status in the greater community and the market demand for their vehicles.

C. Supply Chain Trends and Motivational Factors

The supply chain category is the third and final category in which trends and motivational factors are examined. It can also be argued that it is the most important category, as the relationship between the supplier and the manufacturer and the relationship between the end-product manufacturer and the consumer are the areas where true change is implemented.

Table 4: Automotive Supply Chain Trends and Motivational Factors

automotive		Motivational Factors

	Trends	Internal	External
Supply Chain	suppliers creating green technology	dedicated leadership; perceived competitive advantage; profit maximization	potential market and regulatory pressures; manufacturer/supplier pressure
	adoption of ISO14001 standards	perceived competitive advantage - changing corporate; perceived public relations	potential regulatory and market pressure; social pressure

There are two main trends represented under the supply chain classification. The first trend is the creation of green technology by the supplier (Table 4). Suppliers are either required to create this new technology by the manufacturer or they develop technology as a means of attracting the business of the manufacturers. The concept of the supply chain dictates that the manufacturer plays the role of the supplier's customer, much like consumers are the customers of the manufacturer. Many manufacturers mandate that in order to do business with them, suppliers must develop green technology or use green materials. On the other hand, several supply companies are taking it upon themselves to use green materials and technology in order to attract more customers.

Companies like Borg-Warner Automotive, Inc., Hoecst Celanese Automotive and the BASF Corporation, create and produce green materials as a way of attracting manufacturers. In 1999, Borg-Warner decided to take advantage of the increasing auto regulations and reinforce its turbocharger and timing chains production particularly in Europe (Vinas ,1999). Hoecst Celanese Automotive and Dupont Automotive began developing an "all polyester

component system, such as seats and headliners, to reduce mixtures and enhance recyclability" in 1994 (Winter, 1994).

The BASF Corporation constructed a pigmenting process that colors fibers before they are made into carpets, as opposed to dyeing them afterwards. This process is now being used for the Dodge Neon's carpeting. The environmental value of this process is that the toxic fumes and effluents that are produced during the conventional dying process are eliminated. In addition, BASF launched a undertaking with Philip Services Corporation in September, 1997 for the purpose of recycling polyurethane, "a non-biodegradable waste material from the auto-part production," (Chappell, 1997). At the time, this was not well received but BASF believes that there will be money in this particular green project over the long term (1997). In other words, BASF is taking a pro-active step in the recycling of polyurethane because it may attract manufacturers in the future.

Tenneco Automotive developed what they claimed as being a "strong emissions product portfolio that will help automakers meet the coming environmental standards," (Sorge, 2000). Tenneco is counting on drawing in manufacturers as new customers as new environmental standards may force automakers to add another catalytic converter to their exhaust emission systems (2000).

Most often, suppliers are being required by manufacturers to apply green methods and practices. For instance, Toyota is mandating that its 500 American-based suppliers adopt more rigid environmental standards (Jusko, 2000).

Suppliers are required to meet one or more of the following initiatives: “obtain ISO14001 certification, comply with Toyota’s chemical ban list or develop policies and procedures to ensure compliance with all hazardous materials transportation requirements,” (2000).

GM Canada moved to a single Tier one supplier that “acts as its chemical manager and provider,” (English, 1999). This method renders a intimate bond between Volvo and its suppliers.

One internal motivational factor for suppliers creating green technology is the dedicated leadership. The mere fact that manufacturers are either requiring its suppliers develop such technology or by them being drawn to suppliers because of their new developments suggest that the mind-set of corporations is changing to consider environmental impact a key and important issue. Competitive advantage is another internal motivational factor. Manufacturers who employ new technologies developed by their suppliers may be motivated by the apparent advantage that they may gain.

Perceived market demand and profit maximization also provoke companies to participate in this direction. As in the automotive industry, a ‘green’ product can not be created using a ‘brown’ process. The market may demand that the entire production process be ecologically sustainable. Thus if a company gains a reputation for not using green materials, that would not only damage their market share value, but the end result could mean a loss of profits as well. Externally, market and regulatory pressures place additional demands on

manufacturers. Auto manufacturers must respond to both market and regulatory developments

The second and final trend under the supply chain classification is the adoption of ISO14001 standards (Table 4). More specifically, there is a new trend in which manufacturers are requiring their suppliers to be ISO14001 certified, in addition to the manufacturer being certified themselves.

In September 1999, both Ford and GM published that they would require their suppliers to be ISO14001 certified (Wilson 1999; Sabatini 2000; *Quality* 1999; *Industrial Distribution* 1999). Toyota has also demanded its suppliers use ISO14001 (Jusko 2000). GM and Ford state that ISO14001 certification only proves their commitment to the environment (Wilson 1999; Sabatini 2000). While some say this certification is a step in the right direction, skeptics argue that "Ford and GM are not specifically requiring their suppliers to meet their respective environmental performance standards," (Sabatini 2000). In other words, critics question whether the ISO14001 certification will indeed make their environmental performance more valuable (2000).

Despite the critics' arguments, ISO14001 certification has been regarded as a step in the right direction. ISO 14001 certification of a manufacturer's suppliers is an example of the cradle-to-grave scenario. The dedicated leadership and the perceived competitive advantage internally motivates corporations. Externally, automakers are motivated by suppliers trying to promote their products, along with any the impending regulatory and market changes and general social pressure to adopt ISO14001 strategies.

D. Automobile Motivational Factors in Summary

The previous section listed several factors that took place within the product, process and supply chain categories. Certain motivational factors, both internal and external, seemed to be present in most of the trends. For example, the perceived competitive advantage, dedicated leadership, perceived market pressures ad perceived profit maximization were the main internal motivational factors demonstrated in all three categories. Market and regulatory pressures seemed to be the main external factors in nearly all of the trends throughout categories as well.

While each internal and external factor is considered an important aspect of how the industry responds to certain developments, some carry more weight than others. For example, profit maximization seem to be the most influential internal motivational factor in several of the trends. A reason for this could be the profit maximization mentality of businesses in the automotive industry. Organizations want to augment their profits as much as possible, and by participating in voluntary programs, complying with federal and local mandates or even taking voluntary actions, plays a role in getting the company to its bottom-line end-goal. Other key motivational factors in the categories will be discussed in detail in Chapter 5.

IV.

Trends and Motivational Factors in the Building Industry

This research created a detailed database from the literature on green actions within the building industry (Appendix 2). The same analysis process was applied to the building industry as to the automobile industry. An examination of the literature unveiled several reoccurring themes that seemed prevalent throughout the literature (Appendix 4). Those themes were extracted from the database and then categorized in the final matrix by product, process and supply chain (Table 1). Internal and external factors were identified as they related to the given trend. The following sections in this chapter describe the trends and motivational factors within this framework.

A. Product Trends and Motivational in the Building Industry

Four trends are visible under the product classification: the use and development of a certification/rating system, voluntary green building programs, the development of product regulations and the development of new technology (Table 5).

The development and use of a certification rating system is a trend that is being sponsored by the building industry itself. The U.S. Green Building Council has been named as being at the forefront of this movement and has worked to set certification systems for both public and private buildings. Moreover, the

USGBC has been working on getting a national system established. “The goal is to develop a certification system that accredits builders and the homes they build for various levels of energy efficiency and environmental design,” (O’Toole 2000). But “the ultimate goal is nothing short of market transformation,” (Stromberg 2000).

Table 5: Building Product Trends and Motivational Factors

Building		Motivational Factors	
	Trends	Internal	External
Product	development and use of certification/rating system	market pressure; profit maximization; perceived public relations; incentives for technology innovation	market pressure; potential regulatory pressure
	voluntary green building programs	dedicated leadership; perceived public relations market and profit maximization	market, regulatory and potential local governmental pressure
	compliance with product regulations	regulatory compliance and relief; dedicated leadership	market pressure, organizational pressure, regulatory pressure; social pressure
	development of new technology	perceived market and profit maximization; perceived competitive advantage; new technology development	market pressure; regulatory pressure; social pressure

So far, there are two national rating systems currently poised to be implemented. First there is the USGBC’s Leadership in Energy and Environmental Design (LEED) Commercial Green Building Rating System (Crowley 2000). The program awards credits to builders who satisfy a comprehensive set of guidelines (von Paumgartten 2001). In addition to energy usage, the use of recycled materials, water conservation, indoor air quality, energy efficiency and site planning are also areas builders must adhere (2001). This rating system has earned the support of federal and local governmental

agencies. There is also a counterpart program, entitled LEED-Residential (LEED-R), which is modeled after the LEED-Commercial rating system.

A ratings system such as this is critical, because there is really no set or single designation of guidelines that builders can use as a model (O'Toole 2000). This rating system will also go a long way in setting the tone and definition for the term green. While some builders support the need to have a more uniform definition, others argue that the builder should define green building, as different regions need to focus on different aspects of green building (Dietsche 2000; Horowitz 2000; *Professional Builder* 1999). Richmond Powers, chair of the LEED Residential Committee, stated in a *Professional Builder* article, that the "LEED Residential will be prescriptive and umbrella-like, allowing builders to set the goal in any way shape or form," (O'Toole 2000). "The aim of the voluntary ratting system is prescriptive, rather than purely performance based," (Stromberg 2000). This allows the builders to focus on a sequence of points, and help them to reach those points in a way that foremost fits their business, information on green building practices, consumer demands, geography and climate (2000).

In 1999, Hellmuth, Obata and Kassabaum, Inc. (HOK) and Paric Corporation build a business incubator that earned Missouri's first green building certification set by the (*BioCycle* 1999). The Johnson Controls Brengel Technology Center in Milwaukee, was one of the first 12 buildings to earn the LEED certification in March 2000 (von Paumgartten 2001).

LEED-R and LEED Commercial is not focused on just mainstream builders. It is the "first national green building bar that will be set for high-

certification for leaders in the field, not for builders looking for a marketing angle," (Stromberg 2000).

Internal factors include perceived financial and market pressure, public relations opportunities and incentives for technology innovation. As in the automotive industry, building companies are in business to make money. The positive public relations opportunities that exist when a firm's certification is advertised gives that company an advantage on the market and, arguably, increases its market share value. Financially, because they are receiving more business, they make more money.

Arguably, the most important internal motivational factor is the opportunity for technology innovation. As stated by green building advocates:

> "Change is imminent and builders have the choice to embrace it now, learn how to do it and use it as a way to differentiate their products from their competitors. That or they can risk waiting until change is no longer a choice and smart growth initiatives and local regulations make building the old-fashioned way a thing of the past," (Stromberg 2000).

This statement also speaks to the external factors, market, and regulatory pressures. Firms must be equipped to respond to market demands, while, at the same time, be able to meet and comply with any imminent regulations that might make such activity a priority.

The second trend under product classification is the increase number of voluntary green building programs. There are numerous voluntary green building programs sponsored by organizations in cities throughout the country. The U.S. Green Building Council attempts to stimulate green building "practices,

technologies, policies and standard" in various areas, such as market transformation, education and government and industry partnerships (Barnett 2000). The and Environmental Building Association was established to "promote the awareness, education and development of energy efficient, environmentally responsible buildings and communities," (2000).

There are numerous federally funded green building programs across the country. These programs such as Building America, Rebuild America, and the Partnership for Advancing Technology in Housing (a joint program between the Department of Energy and HUD) attempt to develop models for green building (Barnett and Rossman 2000; Stone 1999). Energy Star Homes, another voluntary federal program, "allows builders to use a wide range of creative options to boost energy efficiently and marketability," McLeister 1998). The U.S. Environmental Protection Agency created this program in order to assist home builders market energy efficient buildings (1998).

The Commonwealth of Pennsylvania has developed the Guidelines for Creating High-performance Green Buildings and the Model Green Office Leasing Specifications, two programs which list detailed requirements for green buildings (Deitche 2000). Under these programs, the Pennsylvania Department of Environmental Protection's headquarters was the state's first model green building (2000). In addition to Pennsylvania, there are numerous state supported voluntary programs, including Oregon, New Jersey, Maryland Minnesota, Colorado, Texas and California (Barnett & Rossman 2000).

Builders can also voluntarily join a local government project to build green communities. There are several examples of such green communities, including Playa Vista, California (Wilson 2000); Austin, Texas (Lurz 2000); Dewees Island, South Carolina (Lurz 1999); Davis, California and Tucson, Arizona (Farnsworth 1993). Hennepin County, Minnesota, Arlington County, Virginia and Alameda County, California also has similar local programs. Most of these programs assist builders who are interested in building green by providing financial assistance.

Austin, TX created the first voluntary environmental building rating system in the early 1990s. The Green Building Program "worked to increase awareness of the benefits of sustainable building practices," (*PM* 2000). The program rates new and remodeled homes in energy, water, and materials efficiency, health, safety and community. Under the program as of 2000, the program certified over 1000 homes (2000). The program also created the *Green Building Guide* in conjunction with the Center for Maximum Potential Building Systems and the Capital Area Home Builders Association (McLeister 1993). The guide listed green techniques and served as a marketing tool for buyers. Supporters of the program think this program is extremely useful because it is "market driven rather than mandated by the city government," (1993).

Internal factors that exist under the voluntary green building programs, from the building industry perspective, include dedicated leadership, perceived market pressure and perceived profit maximization. As it is the mission of the USGBC, in order for green building practices to catch on, there must be a

"market transformation," (Stromberg 2000; Barnett 2000). The building industry has been seemingly slow to catch on to green building practices. Peter Pfeiffer equates this phenomena as stemming from the following two reasons: builders do not want to "re-learn how to build green buildings" and builders are skeptical of the high cost of building green (1999). Despite this skepticism, green building is gaining popularity. Within the various building corporations, this culture of being afraid of learning and afraid of the up front costs, are being dismissed. Additionally, some industry leaders realize that the market is changing. As consumers are made aware of the benefits of green buildings, they will begin to demand that certain energy and water efficient technologies, in addition to other technologies, are put in place.

Corporations are skeptical about the up-front costs of environmentalists argue that green building saves the builder and the building owner money, as there is more efficient use of the energy and water. Builders are concerned about the loss of profits if they do not get involved with green building. Voluntary programs such as these gives builders an opportunity to see what building green is all about.

Market pressure is also an external motivational factor. In the case where a green builder has not thought about the potential market in green building, once it becomes apparent that green buildings is in demand, the builder will adjust practices to be able to meet the market's needs. Regulatory pressure, particularly in the case of state and local government ordinances, has the potential to be the most influential external factor that is demonstrated within this

trend. Local government has the authority to enact ordinances which all buildings built within a given locality must be green certified or use a specific number of green measures.

The next tend is the development of product regulations. The product, in the case of the building industry, is the building itself. The Sustainable Buildings Industry Council published a guide in April 2000, which listed recommendations for green building. These recommendations came as a result of an initiative that required federal buildings to reduce water consumption by 40 percent. Other examples are demonstrated by those communities, such as in Austin, TX and Southern California, in which the local government has passed ordinances that dictate any new building being constructed must meet a number of green requirements.

“Regulations can quickly advance green building,” (Dietsche 2000). Santa Monica, California has passed two building performance ordinances that center on “energy consumption, decreasing storm water runoff and improving runoff quality,” (2000). The New York City Battery Park Commission has set a series of standards that specify the new high-rise building in Battery Park has to be built in order to receive green certification (*ENR 2000*).

Certification and rating systems themselves are also catching the attention of the government and referendums are currently being pushed through to make such systems a national and industry-wide standard (O’Toole 2000).

Regulatory compliance and relief is the major internal motivational factor when it comes to the development of product regulations. Since some builders

seem to be apprehensive of the time and money it will take to re-invest in the art of green building, regulatory compliance is a major cause for concern. Corporations usually look to receive regulatory relief through voluntary programs or programs which offer financial incentives that will bear the brunt of the up front costs. Dedicated leadership is also an internal factor that is present within this trend, as it may increasingly become important that a company's products receive certification.

External motivational factors include market, organizational, social and regulatory pressures; each with a different impact on a building company. Market pressures usually speak to a company's viability in the market. Corporations may feel obliged to participate simply because it does not want to be the only company still using what supports of the green building movement would call the "old fashioned way of building." Organizations, such as the USGBC and other local organizations work to improve the education of builders and the population at large in terms of the benefits of green building. They also lobby the government to adopt national policies, which is where the regulatory pressure comes into play. Society, in general may also begin to push for such regulations, especially as the public becomes more educated about environmentally-friendly methods.

The publicity an organization might receive as contingent upon their participation in the voluntary program is another internal factor. Videras and Alberini investigated the appeal of voluntary environmental programs. They maintained there were four possible reasons why organizations participated: "1)

to appeal to consumers who demand green products; 2) to preempt government regulation; 3) to seek regulatory relief from the agency; and 4) to gain a competitive advantage over competitors," (2000). Videras and Alberini conducted an empirical analysis of organizations and their participation in three EPA policy referred programs, 33/50, Green Lights, and WasteWi$e. Their results indicate that there is a positive correlation between the likelihood of publicity from participating in a voluntary program to an organization's actual participation. This is particularly evident in large firms who are "presumably more visible to consumers and regulators" and firms who publish environmental reports (2000). Additionally, Virderas and Alberini discovered that the "firms with worse performance are attracted to voluntary programs, but only as long as the program is directly related to their own pollution reductions. The "stick-and-carrot" approach increases firm responsiveness to voluntary programs," (2000).

The final trend in the product category is the development of new technology. There have been numerous advancements in this trend, as there are many different technical suggestions for builders on how they can improve the efficiency of a building. Some of these suggestions stem from using an interactive software tool called the Green Building Advisor (GBA) (*Professional Builder* 1999) to using certified wood and wood substitutes (Feinbaum 2000; McLeister 1998), to technology that aims at reducing the chemical emissions (*Professional Builder* 1993), to creating "smart" buildings or digital building management systems (von Paumgartten 2001; Tragott 1999).

Other areas of technology development include the quality of the interior and exterior latex paint, solar-based products, taking new approached to insulating homes and buildings and using environmentally-friendly plumbing products (Feinbaum 2000).

The Consortium for Advanced Residential Buildings (CARB), an affiliate of the U.S. Department of Energy's Building America program, has built a prototype house that uses energy and cost-saving measures (Power 1999). With the assistance of Steven Winter Associates, the home uses 35 – 40 percent less energy than conventional homes. The prototype home makes use of low-e glass windows, engineered-wood products and a three-ton unit. Not only did these materials and technologies prove to be cheaper during the construction phase, but they are also said to be cheaper in the long run (Power 1999).

There are four internal motivational factors for developing new green building technology. The main factors are market and profit maximization. It is a major incentive for a company to have market viability and to make a profit on their products and services. The development of such technology may put them at a greater disposition to do so. Perceived competitive advantage is also related to this ideal. Companies want to be the one to offer certain things that can not be found anywhere else; and attaining the green know-how will put them in such a position. Another significant internal motivational factor under this trend is the opportunity for new technology development. Organizations will not only take advantage of the latest technology that has been implemented by other

organizations, but will also take it upon themselves to conduct research and experiment with technology on their own.

Market, social and regulatory pressures are present within this trend as well in the form of external motivational factors. Both the market and regulations may inspire builders to come up with techniques and technologies on their own, just to offset the high costs or time constraints that may not be available to them if they do not take immediate advantage of this trend. Companies feel social pressure, mainly because industry leaders must consider with how their actions will be viewed in the public eye.

B. Process Trends and Motivational Factors in the Building Industry

This section deals with the green building construction process. Research showed seven major trends in this area, shown in Table 6. These trends include: cost-effective voluntary programs; the revitalization of old existing sites; process regulations; the development of new state and local regulations; changing industry practices; adopting of green building standards; and adoption of ISO14001 certification.

Table 6: Building Process Trends and Motivational Factors

		Motivational Factors	
	Trends	Internal	External
Process	cost-effective voluntary process programs (I.e. tax incentives/ monetary rewards for green building	profit maximization; dedicated leadership; perceived public relations	regulatory pressure

	revitalization of old existing sites	dedicated leadership;	market pressures, regulatory pressure
	compliance with process regulations	technology innovation; profit maximization, dedicated leadership	regulatory pressure; social pressure
	new state and local govt. regulations	regulatory compliance and relief; incentives for technology innovation; profit maximization	regulatory pressure; industry and org. pressure; social pressure
	changing industry practices	dedicated leadership; financial incentives & pressures; perceived public relations	org. pressure; market and regulatory pressure; social pressure
	adoption of green building standard	dedicated leadership; perceived public relations	org. and regulatory and industry pressure; social pressure
	adoption of ISO14001 certification	changing corporate/industry culture; perceived public relations	market and regulatory pressure; social pressure

Often, green builders look to become involved in a voluntary process to learn about green building and for the opportunity to develop and learn about the new technology. The reason for their participation is not just because it is a learning opportunity. Many programs help the builder by providing financial incentives, especially incentives that bear most of the up-front costs during the pre-building and building phase of construction. In return for the funding, builders who participate in such programs must produce a product that achieves certain standards. Builders must also go about building a product in a green way as well.

In New York, funding is available for projects that introduce, develop, evaluate and create green technologies through the New York State Energy Research and Development Authority (NYSERDA) (*Professional Builder* 1999). NYSERDA funding will be given out to projects that do one of the following:

> "Projects must develop and demonstrate innovative tools, protocols and practices for designing or evaluating green buildings; projects that develop order amongst green building products; and projects involving detailed engineering feasibility studies of commercial available energy efficient technologies to make new or existing buildings greener." (1999)

In June 1999, New York City's Department of Design and Construction published the *High Performance Building Guidelines*. According to the publication, those builders who voluntarily comply with the guidelines will see a dramatic reduction in their operating costs (*ENR* 1999). Although it is principally for use on public projects, it can also be applied to private projects as well. New York has also attempted to pass bill that would provide tax credits for building owners and tenants who work to improve energy efficiency, indoor air quality and reduce the environmental impact of commercial and residential buildings in New York (Crockett 1999). Under this law, entitled the Green Building Tax Credit, those eligible would receive a "credit equal of five percent of 'allowable costs,' including the capitalized costs of construction, but excluding the cost of land," (1999).

The Fannie Mae Foundation and the National Association of HomeBuilders (NAHB) have established a financial incentive program in six pilot cities: Atlanta, Columbus, Albuquerque, Denver, Los Angeles and Seattle(Bady 1999; Yost 1999). The program will work to generate initiatives that highlight effective use of resources. In addition, Fannie Mae is offering an extra $100 million for investment in initiatives that "test new housing finance products, support local green builder efforts and develop creative solutions to environmental issues with community partners in those six cities," (1999).

Incentives can serve as an alternative approach to regulations. In Arlington County, Virginia, a new program has been equipped to provide direct or indirect incentives or services, called density bonuses, to inspire builders to build green (von Paumgartten 2001). PHH Mortgage Services the Edison Electric Institute and CSW Services Inc. have joined forces to begin a green incentives program. The program won the Innovative Energy Efficiency Financing Award in early 1998.

Internal factors for the voluntary green programs include perceived profit maximization, dedicated leadership and the perceived positive public relations (Table 6). When an opportunity is presented to an organization that allows them to save money, members of an organization must carefully consider the risk of not participating in such a program. Advocates state that the leadership needs to adjusts from being not only concerned about green building to making it a priority; and once that decision is made, the public announcement is bound to attract business and make the organization look good (perceived public relations).

External factors include the potential for regulatory pressure. “Voluntary compliance is a smart approach, especially politically,” (*ENR* 1999). The more builders comply and prepare for the coming regulations, the more capable they will be in the long run.

Next is the trend of revitalizing old existing sites. Planners around the country have been particularly advocating this movement as it prevents the further destruction of greenfields and reuses already established sites.

Revitalization of the original sites also helps to revive the surrounding community, not just aesthetically, but economically and environmentally as well.

Local and state governments are typically under extreme pressure to get these sites cleaned up. In an effort to help clean up these ‘brownfields,’ local and state government agencies have begun to offer incentives for builders to take on such projects. There are currently two new forms of insurance that curtails the risk of brownfields redevelopment (Lurz 2001). First is the “stop loss” insurance, which protects builders from the cost of clean up that exceeds a predetermined amount. Second is a unique liability clause, which protects the builder from third-party claims of detriment resulting from unforeseen environmental conditions (2001).

The dedicated leadership and the potential for a positive public relations opportunity are the two internal motivational factors that can be associated with the renovation of old sites. Dedicated leadership is an important factor, as most organizations do not want to go through the trouble of cleaning up a brownfield site. Proponents of green building believe that a particular organization to take on such a responsibility demonstrates that there has been an adjustment in what is deemed important within that organization. The positive public relations about their renovation project will also go a long way in terms of advertising their services and especially their commitment to the environment.

Regulatory pressure, an external factor, may very well designate that no new sites may be constructed within a given community. Thus, an organization

may not have any choice at all in terms of where they can build. Such regulations may be on the horizon as the debate about green space and sprawl continues.

The third type of trend in the process section is the development of process regulations. An example of a process law is one that requires the use of recycled or renewable materials in green construction. This is often an important component in the process of green building - a builder can not build a green house without the use of green products. Green buildings must be more than just the use of solar technology and water and energy efficiency measures. The materials that go into a green building must also be certified green themselves. “A green product isn’t always reason enough to buy. Thankfully, many building materials that are made of recycled or renewable materials offer benefits beyond just protecting natural resources - many are more durable, have lower maintenance, or simply add style and distinction to the [building],” (Tomasulo 2001).

An example of green materials is the use of certified, alternative or engineered wood products for the framing of the building (McLeister 1998). Recycled goods, such as plastic and glass, may even be reused for decking or floor tile, respectively. The use of straw and bamboo is especially encouraged, especially since they are both renewable and grow at a faster rate than trees (Tomasulo 2001).

Profit maximization, the dedicated leadership and the opportunity for technology innovation are the prevalent internal factors within this trend. Some builders may be at first apprehensive about using certified wood or renewable

materials during the construction of a building. But advocates of green building argue that not only are these materials cost-effective, they can also prove to be more efficient and last longer than the traditional materials. Builders have the opportunity to get creative with the materials and establish their own 'niche.' For example, a builder might be known for creating an innovative flooring from recycled glass and plastic. An example of such innovation can help a company's market base.

Regulatory pressure may exert some force on the builder to use these materials. A state law may require that a certain percentage of their materials be recyclable. If a builder already uses renewable materials, then the less distance they will have to go in terms of compliance. Social pressure can also designate the intensity and the overall flow of the regulations.

The development of new state and local regulations is one of the most dynamic trend in the building industry. As more and more communities see the importance of green building, more local ordinances and state laws will be firmly incorporated. New York state's Green Building Tax Credit is one example. Although it takes the shape of an incentive-based program than a law, proponents of the law are calling it a "boost for the environment and a model for other states," (Post 2000; Crockett 1999). The program will provide $25 million between 2001 and 2009. Additional credits will be available if the building uses "qualified fuel cells, photovotanic modules or non-ozone depleting refrigerants," (2000).

New York has also made green building mandatory in Batter Park. The Battery Park City Authority is requiring that the next nine buildings constructed in Manhattan's mini-city must follow the environmental guidelines (*ENR* 2000; Stromberg 2000). Green building is the way of life in some communities across the country. All buildings constructed within developments such as Coffee Center Creeke, Chesterton, Indiana (Farnsworth 1999) and within the city limits of San Francisco, Pittsburgh, Chattanooga and San Diego (Traugott 1999) have used sustainable green methods and efficiency measures.

The internal motivational factors behind the new state and local regulations trend is comprised of regulatory compliance and relief, incentives for technology innovation and profit maximization (Table 6). First, building organizations have to worry about keeping up with the new requirements and, if possible finding ways of being excused from those standards. During the search for lessening the regulation blow, the organization may also be inspired to come up with technological ways to adapt, thus making it easier and even cheaper to meet the standards.

Just as the government applies pressure to the builder to meet the standards, other industry representatives, such as USGBC and other environmental green groups, may also be an external influence. Government is quite persuasive, but non-governmental agencies and industry leaders have been notably instrumental in persuading other builders to get involved with green building. These social groups often draw on what society in general dictates what

is socially acceptable, thus making social pressure an important external force companies must acknowledge.

Changing industry practices is a broad trend that may encompass number of things. An example of such changes include builders educating home buyers and consumers the importance of green building, in addition to green building techniques and materials. Proponents of green building argue that the lay consumer has no real working knowledge of green building and it should be up to the builder to inform them of these measures. Oftentimes, builders do not inform their clients of the benefits of green building, or even that green building is an option. Proponents also believe that if given the opportunity, consumers will be willing to pay more for green materials and technology, especially when they find out that they save money over the life-cycle of the house.

The National Association of HomeBuilders began sponsoring a free educational program aimed at elementary students in Philadelphia-area schools, informing them of the importance of green building and energy efficiency (Bady 1999). The program “focuses on the environment, conservation in the home and school and the process of building a home,” 1999).

Taking steps to educate the consumer represents a change of leadership, as some builders did not consider it as being an important step in the past. Educating the consumer may lead to an increase of profits (financial incentives and pressures) and lead to more businesses because of the positive exposure and word-of-mouth (perceived public relations).

As with the previous trend, organizational, social, industry and regulatory pressures play an external role in influencing a builder's decision on whether the company should become involved with this trend. Organizational groups, industry leaders and society at large are beginning to encouraging builders to take this step, as it will make the green movement more successful. However, future regulations may require that all builders inform the consumer about their options whether the consumer asks for it or not. As it was stated earlier, taking voluntary action is more beneficial in the long run, both politically and even financially. If regulations should come to pass, builders will be prepared to conform to them.

The adoption of green building standards is a trend that is just as dynamic with the development of new state and local regulations. It can also be argued that these trends often support each other, especially in terms of adoption and implementation. The adoption of green building standards, however, may or may not be pushed through the government. Sometimes, local green building agencies in communities adopt their own standards and request that builders follow with them.

In addition to establishing a national rating system for commercial and residential buildings, the USGBC also works on installing standards within the certification system (O'Toole 2000; Stromberg 2000). Green building followers hope that setting such standards will make green building the norm instead of the extra ordinary (Farnsworth 2000).

Dedicated leadership and the perceived positive public relations for adopting to such green building standards are the internal motivational factors for

this trend (Table 6). Social and organizational pressures, as well as regulatory and industry pressures, exemplify the external motivational factors. The reasoning behind these motivational factors are similar to the motivational factors exhibited by the changing of industry practices trend.

The final trend that exists under the process trend is the adoption of ISO14001 certification. This is relatively new, as the green building literature revealed only one builder organization has received ISO14001 certification. The building company Spectrum Skanska is the trendsetter, as the company began using ISO14001 as an incentive to build green. Other companies are likely to follow Specturm's lead, especially as green buildings accumulates in notoriety.

ISO14001 certification, as it is in the automotive industry, is an indication of a change of leadership. It can be argued that adoption of an EMS enhances the motives behind going green. This also may be an opportunity for the entire industry to re-adjust, especially if market , social and regulatory pressures (external factors) began stipulating that all builders be ISO14001 certified.

C. Supply Chain Trends and Motivational Factors in the Building Industry

Table 7: Building Supply Chain Trends and Motivational Factors

Building	Trends	Motivational Factors	
		Internal	External
Supply Chain	suppliers harvesting, creating and selling green materials	dedicated leadership; financial and market pressure	preemptive of future regulatory and org. pressure; marketing pressure; social pressure

There is only one trend that is listed under the supply chain section. This is the increased number of suppliers creating, harvesting and/or selling green materials. It is perpetuated by builder demands, as well as, suppliers taking a preemptive move to carry environmentally friendly materials as a way of attracting new businesses.

Paragon General Contractor & Cabinet Maker is an example of building manufacturers demanding its suppliers use green certified materials. The owner of the firm, Christ Stanton, stated in a *Professional Builder* article, that the "firm is making a conscious effort to be more proactive in using certified forest products," (Matesi 1993). His supplier, EcoTimber International, began stocking certified wood products that were superior to the traditional sources.

SKC Ltd. is an importer of Pau Lope, a certified wood product that comes from the sustainable managed forest of Brazil. The wood was recently chosen by the Audubon Society for its boardwalk in Florida (Feinbaum 2000). Not only is the wood certified, but also it is more durable and naturally insect and fire resistant.

Dedicated leadership and the perceived market and profit maximization are all-important internal factors. By a building firm only requesting the use of certified and alternative materials, one can argue that what is considered important in the firm is changing. Such use of alternative products, especially in the case where these products are more sustainable and even superior to traditional materials, can save firms money (profit maximization) and increase their market viability (market pressures).

Future regulations and pressure from non-governmental agencies may also dictate the use of certified materials. Regulations may impose that all builders use certified wood products or other alternatives, such as plastic and steel, depending on the supply of trees. Non-governmental agencies and organizations and general social movements may begin to lobby for those regulations as well. The market may have to be the most consequential impact on how builders react to this trend. Market prices for traditional wood products are currently competitive, but there may come a time when certified wood is more cost-efficient. Thus, builders would have no choice but to use the certified material. It can be argued that it would be most beneficial if builders took advantage of the opportunity to use certified materials and learn the properties of those materials before a time comes when they do not have a choice, nor the luxury of learning the materials.

D. Building Motivational Factors in Summary

The previous section listed several factors that took place within the product, process and supply chain sections. As with the automobile industry, several of the internal motivational factors were also external motivational factors. In addition, some of these factors seemed prevalent throughout the trends. The main internal motivational factors that were demonstrated throughout the numerous trends were perceived market pressure, perceived profit

maximization and dedicated leadership. Frequent external factors were market and regulatory pressures.

Why those factors? The building industry, unlike the automobile industry, is decentralized in nature. Although each builder follows a routine, the same concepts may mean different things to the individual builder. It is argued that there is no set definition for the term ‘green’ in green building. Sustainable practices and products may differ over region. The hot and dry temperatures of the Southwest may require different energy efficiency measures than the rainy dreary weather of the Northwest. In some homes in Oregon and Washington, there is no central air conditioning unit. This is because the average temperature does not call for air conditioning.

Despite its decentralized nature, regulatory influences play a integral role in shaping a builder’s attitudes towards green building. Green building is not as popular as the supporters would like it to be. That is due to the “afraid to try something different” syndrome. Some builders believe that the cost of green building is not worth the effort and they do not have the time to re-learn green building techniques. In order for green building to truly become popular, there needs to be a shift in the industry culture - “nothing short of market transformation,” (Stromberg 2000).

V.

Conclusion

The purpose of this paper was to investigate the prevailing trends and motivational factors that have directed the building and automotive industries to become involved with green practices. This paper also attempted to research the influences public policy initiatives by governmental and non-governmental organizations have on the automotive and building industries in promoting sustainable and green practices. The three objectives were: to examine organizational theory and diffusion of innovation as a means of conceptualizing and operationalizing the greening of industry; to determine the current trends and motivational factors in green manufacturing and other practices within the two sectors and; to ascertain the ways in which public policy has, and is likely to influence green practices within these two industries.

Organizational and diffusion of innovation theory provides a theoretical base and allows for a more holistic approach to the concept of the greening of industry. By understanding how and why organizations operate, it will be easier to comprehend why certain organizations or sectors adopt green policies more than others. Although this was not the focus of the paper, future research should be able to link which organizations are more ‘green-minded’ than others through the application of theory.

An examination of secondary sources on both the automotive and building industries led to the creation of a matrix detailing the common trends

represented in the literature (Appendix 3 and 4). Further examination proved the major trends and motivational factors fell within one or more of the following categories: product, process and/or supply chain. A final matrix was created (Table 1) and each of the different trends representative of each category was examined and discussed. Tables 8 and 9 exemplify all of the major trends and motivational factors within both industries:

Table 8: Trends and Motivational Factors in the Automobile Industry

Automotive	Trends	Motivational Factors	
		Internal	External
Product	Voluntary 'green' programs/actions	Perceived competitive advantage; dedicated leadership	Market advantage & pressure; potential & future regulatory pressure;
	Development and use of green rating system	Perceived profit maximization; dedicated leadership	Market pressure; regulatory pressure
	Developing new technology	Perceived market and profit maximization; perceived competitive advantage; perceived public relations	Market pressure; regulatory pressure;
	Compliance with product regulations	Regulatory compliance and relief;	Market pressures; organizational pressure; regulatory pressure; social pressure
Process	cost-saving 'green' action programs and technology	Perceived profit maximization; new technology development	Regulatory pressure & market pressures
	Renovation of old existing factories	Dedicated leadership; perceived public relations	Market pressures, regulatory pressure
	adoption of ISO14001 standards	Market pressure & dedicated leadership; perceived competitive advantage	Market and regulatory pressure
	Compliance with process regulations	Regulatory compliance and relief profit maximization	Regulatory pressure; market pressure; social pressure
	Voluntary action programs in conjunction w/ govt.	Competitive advantage; dedicated leadership; profit maximization	Regulatory pressure; market pressure; social pressure
Supply Chain	Suppliers creating green technology	Dedicated leadership; perceived competitive advantage	Potential market and regulatory pressure
	Adoption of ISO14001 standards	Perceived competitive advantage - dedicated leadership; perceived public relations	Potential regulatory and market pressure; social pressure

Table 9: Trends and Motivational Factors in the Building Industry

Building	Trends	Motivational Factors	
		Internal	External
Product	Development and use of certification/rating	Market pressure; profit maximization; perceived public relations; incentives for technology innovation	Market pressure; potential regulatory pressure
	Voluntary green building programs	Dedicated leadership; market and profit maximization	Market pressure; regulatory pressure
	Compliance with product regulations	Regulatory compliance and relief; dedicated leadership	Market pressure, organizational pressure; regulatory pressure; social pressure
	Development of new technology	Perceived market and profit maximization; perceived competitive advantage; new technology development	Market pressure; regulatory pressure; social pressure
Process	Cost-effective voluntary process programs	Profit maximization; dedicated leadership; perceived public relations	Regulatory pressure
	Revitalization of old existing sites	Dedicated leadership;	Market pressures, regulatory pressure
	Compliance with process regulations	Technology innovation; profit maximization, dedicated leadership,	Regulatory pressure; social pressure
	New state and local govt. regulations	Regulatory compliance and relief; incentives for technology innovation; profit maximization	Regulatory pressure; industry and organizational pressure; social pressure
	Changing industry practices	Dedicated leadership; financial incentives & pressures; perceived public relations	Organizational pressure; market and regulatory pressure; social pressure
	Adoption of green building standard	Dedicated leadership; perceived public relations	Organizational, regulatory and industry pressure; social pressure
	Adoption of ISO14001 certification	Changing corporate/industry culture; perceived public relations	Market and regulatory pressure; social pressure
Supply Chain	Suppliers harvesting, creating and selling green materials	Dedicated leadership; financial and market pressure	Preemptive of future regulatory and organizational pressure; market pressure; social pressure

A. Key Motivational Factors

Analysis of this matrix revealed that there are three key internal motivational factors and three key external motivational factors that are exemplified across sectors and categories. The key factors were the same for both industries and affected product, process and supply chain trends. The centralized nature to the auto industry and the decentralized attributes of the building industry did account for the weight of a particular factor.

There are three key internal motivational factors and two external motivational factors that are dominant in both the automotive and building industries. Dedicated leadership, regulatory compliance and relief, and perceived profit maximization are the main internal factors. Externally, market and regulatory pressures are the most instrumental conditions that inspire businesses in these two sectors to participate in a given trend. The key factors were determined based on the of frequency of internal and external factors listed on the automobile and building matrixes.

Dedicated leadership is one of the fundamental ways the greening of industry has gained in popularity and become commonplace. Organizations must completely alter some of their business practices, production methods and even re-design their products. If the company does not desire these changes, then such alterations will not take place. Organizational theories support this notion as studies have demonstrated corporations often do not change their methods until they are ready to. However, theory does provide that society at large can

influence the internal leadership. Essentially, what becomes socially acceptable will become a priority within a corporation.

The dedication of leadership is an important issue within both industries. However, because the automobile industry has begun taking steps towards more environmentally sustainable practices, this is the third most important element out of the other key factors. The decentralized nature and the premise that the building industry is slowly adopting to green practices, leads one to believe that the dedicated leadership is more significant.

Profit maximization, is the most prominent motivational factor for both industries. Corporations follow the economic man model. Every action they take is for a self-serving purpose. This is not an effort to denounce the nature of businesses, as it can be argued corporations often use their social responsibility to assist the greater community in a variety of ways. But realistically, corporations are in business to make money.

Perceived market demand is the second most influential internal factor for the automotive industry and the third most important factor for the building industry. The automobile industry has made more publicized achievements in green technology and production processes than the building industry. However, companies, no matter what sector, rely on their perception of market demands. This takes some research and even a little guesswork to determine the needs of the consumers. In both the automobile and building industries, there has been a sense that the market is going ‘green.’ Honda’s television campaign of its low-emission vehicles and the advertisements of builders who are involved in the

Green Lights Program prove this. Why would companies feel the need to advertise their commitment to using environmentally friendly practices and production processes. Because they believe that the market is demanding more and more green products and services. For those organizing that don not believe the market has turned green yet, becoming involved with green programs is an indication they accept the market will go 'green' in the near future.

Externally, the market and regulatory pressures are also influential to both industries. As mentioned earlier, a corporation's perception of where the market is going is a key internal factor for becoming involved in a particular green trend. The market can be a reliable indicator of what is actually happening in the market. If the market were to suddenly change overnight, organizations would attempt to adapts just as quickly regardless of whether they wanted to change or not.

It may also be asserted that organizations play a role in influencing the market as well. The marketing of the SUV is a classic example. Trucks began being marketed toward families in the 1970s as a family car. This campaign came at a time when the oil and gasoline prices were at an all time high and restrictions were placed on every class of vehicle except the utility trucks. Now, in the 21st, century, the SUV is seen as a sporty, "king of the road," vehicle with off-road capabilities and more masculine than the mini-van. Regardless of how industries influence the market, if green practices became a priority overnight of every American consumer, the automobile and building industries would respond and adapt immediately.

Regulatory pressures impact industries significantly, chiefly through regulations, and enforcement of those regulations. It is particularly the enforcement aspect that stimulates organizations to make changes. A new rule could be imposed, but if there are no penalties for not observing the rules, then what would be the motivation for industries to conform? Therefore, green initiatives and polices must focus on the actual law as well as the penalties for breaking it.

There was a slight variation of the level of importance of the internal and external factors between industries. For example, the top internal factors were dedicated leadership, market pressures and profit maximization. The automobile industry emphasized dedicated leadership as the least influential factors out of the top three, while the building industry seemed to put more credence into it, considering this factor second most important. Market pressures seemed to be the second most influential factor in the automobile industry, while it was the least influential factor in the building industry. Not surprisingly, the top key factor was profit maximization for both sectors.

The top two external motivational factors, market and regulatory pressures, were weighted similarly between the industries and they were both considered equally important. What is interesting to note is that there were similarities between how the industries responded to the market and regulatory pressures. While it is apparent that industries often influence regulations and the market, industries are seemingly at the mercy of both regulatory and market

fluctuations and the severity of those fluctuations will determine how organizations respond.

While there are some similarities between the automobile and building industry, there are distinct differences. The automobile industry is more standardized in terms of its processes. Every car has an engine, transmission and other key parts and no matter what part of the country or the world they are made in, the process does not vary by much. In the building industry however, this is not necessarily the case. While every building must follow certain procedures in terms of the order in which things are installed or constructed, buildings and homes vary depending on the region of the country or world that they are located. Corporate image and the future orientation of both industries account for the differences between them. For example, it can be argued that the centralized nature of the auto industry leads the overall green movement by its future orientation and high capitalization. The auto industry is a big money making business and car makers are constantly re-designing existing models and creating new models to make their product more attractive and competitive to consumers. The automobile industry seemingly supports new innovations, but it has less flexibility than the building industry. Automakers have to content with its corporate image, thus any changes that are made may happen more gradual and slower. The decentralized nature of the building industry may leave builders less concerned about their corporate image. Green changes within the industry can happen more quickly and rapidly.

Another critical issue that must be discussed is the issue of “green washing.” Green washing is essentially “the partial use of environmental sound construction [design or process],”)Farnsworth 2000). Companies often use “slick marketing pieces touting green attributes as a marketing ploy.” (2000). This is an important concept to consider, especially since articles have suggested that the building industry is slower to catch on to green methods than the auto industry. It can be hypothesized that because the auto industry is so centralized, it would be easier for individuals to believe the auto industry is moving faster in the green race. Auto makers may simply be using green as a marking tool and due to its highly publicized nature of its products, individuals may be convinced that these changes actually occur. The building industry, however, is not in the public eye as much as the automobile industry, so individuals may believe that the builders are taking longer to adopt to green changes. While researchers have argued that the building is slow to institute green changes green washing must be considered.

B. Policy Implications

Public policy has a significant influence over how industries respond to trends. Certain categories of policies can provoke different reactions. Similarly to the rate of adoption in diffusion innovation, there are two categories for which

policies appertain. The first is mandatory policies or regulations. Such policies elicit an immediate response from organizations, usually because of the impending penalization if organizations do not adhere to the requirements. Policies also fall under the voluntary classification. Depending on the leadership of the company, these voluntary policies typically do not produce such an extreme sense of compliance.

Within these two classifications of policies, there are three main policy types. Regulatory, incentive-based and labeling policies all influence the organization to behave in a certain way. However, how the companies behave is dependent upon whether those policies are mandatory or voluntary in nature. Regulations tend to be mandatory, however standards such as ISO14001 are adopted on a voluntary basis. Incentive-based programs tend to be voluntary in nature and usually promote green practices through financial discounts or other benefits. Currently, labeling policies, such as rating systems and ISO14001 standards are applied on a voluntary basis, but supporters of the green movement are pushing for these policies to become mandatory.

Some proponents of the green movement feel that voluntary-based policies are more beneficial than policies that are mandatory. However, as Videras and Alberini's study pointed out, only certain types of organizations tend to participate in voluntary-based programs. Regulations that are voluntary in nature tend to get the participation of those companies that are interested in improving their image or taking an opportunity to advance their technical innovations. But other environmentalists argue for stricter policies to dictate the

industries' actions. There is a need for regulations that are mandatory because they essentially force companies to adhere to the rules. A blend of voluntary-based and mandatory-based policies are needed in order to attain a balance and a significant advancement of the green movement within the industries. Goals must be set that companies must meet, but at the same time, companies must want to go beyond what is asked. Going beyond the designated rules and regulations is the true measure of improvement.

Green movement advocates also believe that policies are the mechanisms that will promote and strengthen the green movement. As stated in Chapter 2, public policy is the middle ground that connects the industries and the general public. Many environmentalists argue that policies are the only way of addressing the pollution problem, regardless of whether these policies are voluntary-based or mandatory-based.

Policy can help increase the demand for green products, which would insight the industries to develop more green products and processes. Policies which set up educational programs to teach the general public about green industry practices and the environmental benefits can inspire consumers to seek out green products. Governmental, non-governmental and industry sponsored policies also have a notable impact on increasing the demand for green products as the more pressure industries receive, the more green products they will produce.

C. Implications for Future Research

The profit maximization mentality of corporations is not a new finding. What is most important about this discussion is the framework for which it is examined. By investigating the trends and motivational factors in three distinct yet associated categories, one can begin to understand how to adopt policies to encourage those trends. However, empirical analyses of these key trends should be conducted in order to prove the frequency and the weight organizations give to these internal and external motivational factors.

Another topic for future research is the rate at which green washing occurs in both industries. There is little empirical data regarding green washing. A recommendation for future research would be to conduct an empirical study to determine the difference between what both industries advertise and what actual green methods they have instituted.

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Appendix 1: Automobile Industry - Initial Data Matrix

Authors	Title	Summary	Trends	Motivations		MISC
				Internal Factors (managerial)	External Factors (org. pressures)	
Stoll, John	Faded Ford Factory will have new Shimmer	Dearborn Truck Assembly Plant/ Rouge Steel facility being transformed from a brownfield site into a ecologically and worker-friendly complex (in Dearborn, MI)	renovation of old facilities to be more ecologically and worker friendly	CEOs and upper level management of Ford want to be leading the industry in ecological advancements; foster a healthier work environ. & have more productivity	improved public perception; competitive advantage over other car manufacturers; political trend is leaning more towards developing environmentally friendly practices	managing contaminated rainwater through a new roof and new parking lot; solar and fuel cells for computers; new paint shop; implement flexible and lean manufacturing principles; started construction in Nov. 2000
N/A	GM draws 'sustainabl e' business blueprint steeped in green	GM redesigning plant and manufacturing process in Lansing, MI; also notes other environ. advancements made by GM	renovation of old facilities to be more ecologically friendly	CEOs and execs of GM, like David Skiven, want to be known as leading the industry in environ. advancements	improved public perception, competitive advantage over other car manufacturers; political trend leaning towards developing friendly practices;	see list in article; discusses groundbreaking Saturn plant in TENN; also discusses several other plants in which envrion. advancements have taken place
N/A	A Driving Force Behind Tomorrow's Greener Cars	Toyota and Honda has created hybrid gas-electric vehicles to cut CO2 emissions	new technology regarding car design	execs. want to have competitive advantage; also to be known as leading the industry in environ. advancements	improved public perception; competitive advantage; politically looks good to have environ. friendly practices	Toyota was first auto maker to market a hybrid gas-electric gas car; more advanced than US in alternative fuels and power trains; e.g. of new technology
Sorge, Majorie	Tenneco Goes Green	discusses automotive emissions control product plans and examples of new technology for automobiles	using green technology to pay bills; earn money	N/A	as a result of growing environ. issues and concerns, argues changes should be made	other types of technology instituted; also includes brief discussion of regulations

Vinas, Tonya	Green = Growth for Borg-Warner	Chicago based company may benefit because of the increased environmentally related regulations	N/A	N/A	regulations will help boster the company's business	hints on technology diffusion
N/A	Thinking Green	AC-Delco and its diffusion of technology to meet certain standards and to eliminate certain problems associated with the automotive industry and the aftermarket	designing technology and methods to recycle materials	N/A	recycling programs influenced by legislation, laws and regulations	article also focuses on regulations and use of recycling technology - can also be used in policy and innovation section
Winter, Drew	Green' is the best carpet color; textile industry is moving to be....	discussion on innovations that can make carpet textiles used in cars recyclable	making carpet more environ. friendly	automotive makers want low costs, high durability and good looking carpets	environ. issues puts pressure on textiles to be more recyclable and more safe	discusses technology gone into making carpet recyclable
N/A	Green cars, blue skies: battery research red hot	New laws in 12 states, including Calif., call for zero emissions, which forces the auto industry to take another look at creating electric cars	to create electronically-operated cars in lieu of the traditional gas operated car	to become 1st in the race to create a sustainable battery for an electronic car	laws and regulations are forcing the industry to create electronic cars; in order to create an electronic car, must create a sustainable battery	diffusion of technology issues, examples of green policy; the Big Three?
Katcher, Phil	Chemicals and the environment: partners in progress	discuss how chemists and the chemical industry can work with the automotive industry to institute more environ. friendly techniques	to use environmentally oriented products	N/A	marketplace a major influence on chemical manufacturers; auto makers can create demand for certain products	gives tow reasons why manufacturers find it hard to create and promote safe product; list what constitutes a safe product; deals with diffusion of innovation

N/A	How Green was my SUV: why are gas guzzling Ford and GM suddenly quarreling.. ..	discuss how both Ford and GM will be impacted by the Senate's decision to allow the National Academy of Sciences to come in and inspect fuel-economy and fuel emissions	regulations that impact automotive technology	competition is a source of inspiration	competition between automakers; Senate allowing the Nat. Academy of Sci. to assess fuel-economy rates, which will influence the development of cleaner more efficient sport utility vehicles; market appeal; public perception; genuine environ. concern?	GM wants to be greenest car company, but both Ford and GM fuel efficiency is lower than that of Toyota and Honda; new models will improve image
Huber, Peter	The Green Car Paradox	argues that regulation of auto fuel efficiency is counter-productive; argues real objective to develop more efficient cars is aimed at less energy consumption, which means more consumption overall	N/A	move to create more in-company capital	legislators who influence the auto makers call for a lower cost of energy, but author argues that because of the low cost of energy, more energy will be used	N/A
Buch-holz, Kami	Clean and Green w/ ISO14001	discusses auto industries use of ISO14001 and the benefits that is associated with it (Ford, GM, DaimlerChrysler Corp.)	using ISO14001 standards as a means to use environ. safe practices and to save money	money saved by using ISO14001 standards can go to product development; impacts bottomline profits; trying to turn this into a corporate culture - educating workers and engineers on how to design for the environ. argues it is everyone's responsibility;	marketplace, competition; compliance with legislation; auto industry has impact on suppliers as well	recycling methods; o/ stats.; GMs audit program, chemicals management program; internal rule compliance also an issue; GM's list of goals and status

Ziwica, Karl-Heinz	BMW looks beyond the mandates	discusses BMW's moves toward operating in an environmentally responsible way that goes beyond federal mandates	voluntarily instituting environ. friendly methods and practices	trying to maintain competitive edge; trying to make it a corp. culture to recycle	regulatory mandates and legislation as well as consumer's desires influence BMW's drive	e.g. of technologies and methods used in BMW; article seems to be PR for BMW
Ogando, Joseph	Turning Green	discusses key technical strategies to improve SUVs and pick-up truck fuel economy; announcements regarding GM and Ford's new SUV product line	voluntarily instituting environ. friendly methods and practices	corp. culture; want to gain a competitive edge over other manufacturers	Ford and GM responding to public, political criticism, criticism from green support groups; compliance with mandates	discusses diffusion of innovation; mentions Jason Mark and his creation of two SUVS; article compares Ford and GMs methods
N/A	Jaguar goes green	Jaguar institutes a Nedalo CHP unit in an effort to improve energy efficiency in all its plants	creation of new technology that is cost efficient and environ. efficient	bottomline savings; competitive advantage	public appeal, meeting with the federal mandates, etc.	technology diffusion
N/A	Ford's Green SUVs	Ford claims that it will increase fuel efficiency in its SUVs y 25% by 2006	voluntary use of technology to employ environ. friendly practices	competitive advantage?	federal mandates, consumer/public market	Ford argues that efficiency gains will be achieved by using unspecified engine and material technologies to reduce fuel use and weight
Jusko, Jill	Toyota tightens 'green' standards	discusses Toyota's movement towards pushing its suppliers to adopt stricter environmental standards	voluntary use of in-house mandates	adjusting corporate culture; instituting a company goal of being a global environ. leader in products and processes	impacting suppliers and forcing them to adapt stricter environ. standards; influenced by the market and by the legislation	forcing suppliers to adapt one or more of several initiatives such as ISO14001 certification compliance w/ Toyota's chemical ban list

N/A	How to get green cars on the road	discusses the need for incentives to insight consumers to use 'green' vehicles	tax/monetary incentives for consumers to use 'green' vehicles	N/A	auto industry and green orgs. hoping to influence congress to create tax incentives; auto makers are also market driven and if green cars are to get on the road, more consumers must demand them	price is an issue that keeps green cars off the road; "market research shows that drivers buy cars on price and save their planetary concerns for the opinion polls; e.g. of Ariz.'s failed incentives program (policy implications)
Stoffer, Harry	EPA eyes green rating: Agency wants to rank cars, trucks based on their environmental impact	discusses the new EPA rating system for new car and truck's impact on the environment	rating system for vehicles that rates fuel economy and tailpipe emissions	N/A	auto industry inspired EPA to create rating system as rating system is looked at similarly to the crash rating system; @ same time, industry will be directly influenced by rating	also mentions the publication of the rating system and the fact that consumers are paying attention; also discusses the downside to the rating system (being too complicated, not rating cars and trucks accurately or fairly, etc.)
N/A	Green groups target Mercury in Automobiles	discusses the continued use of Mercury in U.S. manufacturers vehicles	mercury removal	change in corp. culture when it comes to using mercury	U.S. manufacturers may be inspired to discontinue use of mercury because BMW, Toyota and Volvo don't use it anymore; potential market impacts and legislative action	15.6 metric tons of mercury being released every year; Ecology Center and o/ green groups released a report that state the use of mercury is unnecessary; mercury is being banned in thermometers by many city and state gov. due to increasing health concerns

N/A	It isn't easy going green alone	disusses the potential impacts that Ford's statements to be more environmentally conscience	voluntarily developing new environ. friendly technology; creating of hybrid vehicles	changes in corp. culture in terms of making cars envion. friendly	W/ Ford's announcement/report, inspires other companies (GM and DaimlerChrysler) to do the same; market-driven; PR, hoping to beat the gov. to the punch	initiatives discussed (avoid gov. regulations and mandates), can come up with new technology; can save money; competitive issues and timeliness factor (regarding the release of the hybrid vehicles)
N/A	Green' cars get green light for HOV lanes	Calif. has a new law that will allow drivers of electric vehicles to ride in the HOV lanes	using laws as incentives to promote environ. friendly vehicles	N/A	laws impact consumers as well as auto industry; CA has laws that require 10% of all new cars purchased must be zero-emissions	HOV lane usage used as an incentive for consumers to buy zero-emissions cars
N/A	ACEEE Announces Green Car list	American Council for an Energy Efficient Economy (ACEEE) has published a list on the most greenest vehicles	rating system/best-worst list to inspire evniron. green cars	N/A	The publicity from the ACEEE list may play a part in auto industry's revamping of certain vehicles listed as the most polluting cars	e.g. of vehicles that scored the highest and the lowest; also want to use list to encourage consumers to buy green cars and to make such information available to the general public
Chappel, Lindsay	Going green sometimes bolsters the bottomline	auto makers realize that using green practices can actually save them money and impact their bottomline	environ. practices saving manufacturers money	adjusting corp. culture to use environ. methods not just because it is environ. safe, but because it can save them money; also lets workers know that the admin. cares about their health and safety	cheaper costs of production will inspire auto makers to use environ. techniques	low cost an incentive or high up front costs will mean more savings in the end; inspires the development of new technology (BASF) e.g. Chrysler
Henry, Jim	Germans put red line ahead of green theme	listed several new model cars created by BMW, Mercedes-Benz and Volkswagen at a Tokyo auto show	fuel cell car	corporate culture to be a market leader in all segments (environ. friendly - luxury vehicles)	influences other manufacturers; will have impact on market economy	Mercedes states that its fuel-cell car will be commercial feasible in eight years, but they, as well as o/ companies, are still making those big luxury vehicles

Treece, James B.	Green Theme dominates Toyko	1997 Tokyo motor show reveals some energy/environ. friendly models by Honda, Mazda, Toyota and Nissan	direct-injection engines, hybrid powertrains and fuel cell vehicles (more EVs)	changing in corporate culture (making environ. issues a key goal in car production); not just concerned w/ bottom line	competition between Japan and U.S. manufactures, argument on whether Japan's environ. friendly vehicles are just for 'show' (Japanese policy implications)	discussion of Toyota Prius, three categories of alternative powertrains; e.g. of environ. friendly cars by Nissan, Toyota; discussion of plans to bring hybrids to the market (Toyota, Audi, Nisssan, Honda)
Jewett, Dale	Big 3 go green at Detroit	The Big 3 unveils plans for green cars	fuel cell, hybrid vehicles	changing corporate culture	competition from Japan influencing new technology and engineering; responding to potential political pressure from cleaner vehicles (PNGV program)	Big 3 - Ford, GM and Chrysler involved in a joint federal government program called Partnership for a New Generation of Vehicles (PNGV); different models and their capabilities for each member of the Big 3
English, Bob	GM Exec: Makers can be green and cut costs	discusses the environmental concerns and movement towards more eco-friendly practices w/ GM Canada	changing corporate culture; looking at environ. friendly vehicles as cost-efficient	changing corporate culture (making the environ. a top priority) especially if the company wants to operate efficiently; ISO14001 standards and how it impacted worker morale	argues that working together will not hurt competition but that the environ. is more important that competition; working with volunteer gov. programs better than standing back waiting for regulations	policy impact and incentives for developing new technology; pollution-prevention techniques can reduce waste and cut costs; GM Canada and its influence over its suppliers; the creation of the Canadian Automobile Manufacturing Pollution Prevention Project
Stoffer, Harry	Toyota puts green image at risk in EPA Court Battle:...	Toyota prepares to face the EPA in court over claims that its vehicles contain faulty emissions equipment	policy control and federal regulations on emissions	bad PR for Toyota, however, the company does not believe it is incorrect	severe policy implications (the EPA's control, the role of the states and other federal agencies	the Calif. Air Resources Board's role; the exact situation is explained

Treece, James B.	Honda Engines go lean green	discusses Honda's plans for enviornmentally friendly vehicles	competition; alternative powerplant usage (diesel engines and fuel cells	competition; corporate culture emphasizing importance of new technology development	Honda's engine improvements will raise the bar for the industry on environmental powerplants	Honda's predictions for their environ. friendly cars; Honda history; prototypes
Stoffer, Harry	Gore learns it's not easy being green....	Gore's book and his statements on the impacts vehicles have on the environment	policy control and federal/intern-national regulations	worries manufacturers because they fear compliance standards	policies can alter the way technology is invented; points out that administration impacts the industry	discussion of 1997 Kyoto Japan and the development of the international treaty (US required to reduce emissions by 30%
N/A	Brawny but green	discusses th Dodge Power Box	new technology; hybrid vehicles	N/A	N/A	details of the Dodge PowerBox
N/A	Green Competitio n	discusses the highlights of Honda's rivals' plans	new technology for environ. safe vehicles	N/A	competition	details of Mitsubishi, Toyota, and Nissan's plans
Kisiel, Ralph	Price rules green cars, D/C says	discusses how Daimler Chrysler will make green cars affordable for consumers	affordability for green cars; fuel-cell technology	financial issues	market; competition	details on the Necar 4
N/A	How green was my volvo	Volvo's efforts to increase environ. practices	increase in dealer awareness for environ. practices	change in corporate culture?	market, advertising to increase good PR	details; Volvo wants sales people to include the environ. in their sales pitch
Stofferl Harry	Green groups to Clinton: get tough with auto-makers	discusses the Clinton Administrations movement towards toughter regulations	call for increased regulation on vehicles	N/A	automakers will have to live up to regulations set up by legislators	details of the events regarding the Clinton Admin. move to increase regulations
Treece, James B.	Japanese Poll: Green is good	discusses JD Power study	consumers willing to pay for green cars	financial issues	study could have impact on regulations	details of the JD Power Asia Pacific study

Appendix 2: Building Industry - Initial Data Matrix

Authors	Title	Summary	Trends	Motivations		MISC
				Internal Factors (managerial)	External Factors (org. pressures)	
N/A	State funds green building project	NY state fuds are available for residental projects or green technologies	monetary incentives or the development and use of green technologies	N/A	legislation insights, by way of monetary incentives, the development of environ. practices	monetary funds to develope, evaluative, demonstrate or introduce green technologies; funds three types of projects - has policy implications
N/A	Seeking state's first green building certifica-tion	HOK to build a business incubator that is hoped to ern MI's 1st green building certiication	using U.S. Green Building Council green certification standards	N/A	competitive advantage;	details of the layout
Pfeiffer, Peter	Mainstream ing green building	discusses things to consider when building a 'green' home	out-of-the-box' thinking in terms of green building; green building acceptance	companies must change the ways in which they view 'green' building; must think creatively and differently; does not have to be expensive, nor does it require that builders must completely re-learn how to build	advantageous for companies to practice green building on a volunteer basis; argues that there is no nation-wide answer to green building strategies - each region must consider certain things; policy implications	lists several methods that can effect efficiency of a home;

Horwitz, Barbara	Corporate conservation in action	discusses the role that corporate America plays in green building and the movement towards green building	change in corporate culture; thinking differently about green building; green building becoming more popular; setting a definition for green building	increased worker productivity as engineers and workers feel as if they have more of a say; environmental concern and corporate responsibility needs to be ingrained in corporate culture; economic incentives	corporations can influence building industry by dictating to them desires of using green building techniques; engineers can also impact green building by asking clients critical questions during the design stage	Green Buidling Council and its green building rating system; e.g. of companies using green building models
N/A	Defining green building strategies	discusses the use of an interactive tool designed to assist users in identifying strategies for green building	defining strategies for green building	N/A	marketing this information will make it easier for the building industry to comply with green building technques	list of what the CD-Rom will cover; dicussion of the annual Green Building Conference and what will be covered at the conference
Kliment, Stephen	Green giant+B26	discussion on William McDonough and his view points on green building		N/A	N/A	brief biography; review of his standpoints (limiting parking space to encourage walking, encouraging solar orientation of buildings, mix of housing types, etc.)
Wilson, Richard	L.A.'s West Side Story	Playa Vista, CA - built as a green community	green communities	N/A	green communities can influence local and even state gov. and infrastructure; will also use peformance guidelines and design standards	location; groups involved in the agreement between Summa Corp and the local gov.

Post, Nadine M	New York State Tax Incentives Called Boost for Environ-ment	NY state tax incentives are expected to boost green building	tax incentives to inspire green building	helps to adjust corporate culture; saves building companies money and provides them with an incentive to recieve tax credits	can serve as a model for other states; policy implications - tax credits ease the bite of meetng standards	details of the tax credit program; requirements
Lurz, Bill	Metro green	green building in The Summit+C9 Austin, TX	consumers requesting green housing; product trends; process trends?	cost issues	serve as a model for other communities	
N/A	Green buildings can mean greenbacks in the pocket	discusses how New York City and Los Angeles have turned to using green building techniques and how it is a money-saving venture	green building as being cost-effectie and even saving money; green building becoming more widely accepted	changes corporate culture; bolstering the bottom line is considered important;	achievements made in NYC and LA can influence other cities, thus influencing policy and legislature	NYC and LA achievements; Seattle, Austin and Portland, Ore.; NYC's development of a manual to be used primarily for public projects but open for anyone to sue
N/A	Defining what 'green' means	article argues that there should not be a single standard to define green building	advocating that individual building and architect contrctors define 'green'	giving the individual home builder the opportunity to adopt a definiton or to define 'green' that best suits location and buyer should be done on a volunteer basis	consistency is an issue and it may come into play in terms of the interaction between builder associations?	different definitions of building 'green'
N/A	Green buildings	dicusses Austin, TX's first voluntary environmental building-rating system	creatng a ratings system; increasing awareness of green building	good PR; can be used as an example; incentives	influences on programs and building associations; also influence policy	details on the program rating categories; statistics o builder pollution; potential policy implications

N/A	Putting 'green' into practice	New York putting green standards into practice through the costruction of a high-rise	creating guidelines and incentives for green building	good PR; can be used as an example for other cities to base their efforts on	influence on other programs or associations; impact on future policy and issues of policy compliance	Battery Park City Authority using its poer to require green building for 9 future buildings in Mahnhattan
N/A	Feds Cultivate Green Buildings	decreasing water consumption and using other energy saving techniques in governmental buildings	advertising the use of green building	saving money; foster and help initiate change	N/A	Low-Energy Sustainable Building Design for Federal Managers produced by Sustainable Buildings Industry Council
Horowitz, Dean	Sustainability	states that the real meaning of green will come through understanding sustainability	using green as just a selling point	looks good to community; but can also save an organization money	saying 'green' sounds good, but it needs to be put into practie	builders just looking for a sophisticated market position statement
Farns-worth, Christina B.	Green Washing	discusses the popularity of using the 'green' label on buildings	using green as just a selling point	companies are skeptical to try green techniques because afraid of the high up-front costs; using green techniques can have a direct impact on the worker's health; just using the 'green' label is good for PR	green techniques and practices are beginning to be included in the legistalure and ordinances of localities (e.g. Oakland in city's permit building	US Green Building Council in its LEED program - details & effects; different def. of green building; different conceptions of the process; notable quotables, e.g. of places where green building is used,

N/A	Green building now: Part 1	discusses alternative techniques and products and the need to attract customers	despite all the information that is being put out there, not impacting construction - no consumer demand -- new trend: to increase consumer demand	green building has benefits for the worker - directly impacts his/her health and the health of the consumer; need a change in culture - building industry should begin to initiate green practices to inspire consumers - need to move out of pilot phase	consumer demands must be increased; policy implications	LEED program; six features that reduce consumption pollution, improved occupant conditions; national Association of Home Builders Fannie Mae's Environ. Mortgage Pilot Program; more guidelines
Yost, Peter	Green and growing	article argues that building industry can impact consumers	building industry using its influence by telling consumers about the benefits of green building	lower costs; change in industry culture	N/A	N/A
Yost, Peter	Green and growing	article argues that building industry can impact consumers	building indusrty using its influence by telling consumers about the benefits of green building	lower costs; change in industry culutre	increase in consumer demands; voluntary participation in green programs can offset mandatory participation	discussion of two axioms (people will pay for green houses? & the more perfect the info, the more perfect the selections); if buyers and lenders join partnerships with building community groups and gov. agencies green building would be a necessity

Barnett, Rick	Greening the Private Sector	private individuals and organizations promoting use of green building practices	increasing consumer demand?	need a change in industry mentality; one reason why it hasn't been accepted is market demand and fear of cost	orgs. dedicated to advancing role of green building have lead to the development of policy statements, design, product and contruction guides, rating systems, etc.	discusses incentives for residential and commercial green building;advancing the role of green building within the industry; list of orgs. who are committed to increasing awareness and promote green building
Barnett, Rick and Pam Rossman	Greening the Public Sector	the public sectors efforts to promote and increase the use of green building practices	government agencies using green buildings techniques; increased state programs	why? cost-saving, sets a good example for evnironmental responsibity	N/A	several state agencies are advancing role of green building (OR NJ, PA, NY, CO, MD, TX, CA, Minn.); also mentions work on County level
Strom-berg, Meghan	National green building standard takes shape	discusses the building process of LEED and the need for market transformation	creating of rating system, volunteer green programs	question of culture and marketplace demands - mainstream builders are not going green because they think lack of market	do it now before it is forced upon builders by way of local regulations and smart-grow iniatives	N/A
Lurz, Bill	Greenest of all	green building on Dewees Island, S.C.	private developers using green practices & selling the homes successfully	N/A	N/A	uses tight environ. and arch. controls; developer believes here are several psychographic trends which draw residents to the island; real issue - building planned communities

O'Toole, Patrick	USGBC to develop National Green Residential Rating System	details about the USGBC's LEED-Residential program	volunteer programs/ umbrella programs	firms will have specific guidelines they can follow	interested in market transformation;	eight green rating systems in the coutry - use this one as an umbrella; differences in programs
Feinbaum, Robert	Environmentally sound home building products	review of green building products	increase demand in green building products; suppliers?	N/A	attempting to attract building firms as customers to use environ. friendly products	wood and wood substitutes; coatings; solar; insulation; plumbing products; e.g of supply chain and process
Deitsche, Tom	Green building goes local	discussion of how green building is becoming more popular	green buildings popping up in the gov. sector, and through regulations and incentive/ volunteer based programs	better to practice green building voluntarily than to be forced to participate; financial incentives and savings a issue	regulations; organizaional pressure for building firms to build 'green'	discusses benefits and goals of building green; e.g. of gov. buildings that are 'green'; e.g. of building codes; e.g. of incentives given for the private sector; o/ gov. programs
Crowley, John	Seeing Green	discuss the consumer's role in green building	increased consumer demand of green buildings	builder can directly impact consumer demand by suggesting home be 'green'	green tax credit legistlation, efficiency mortgage programs (Fannie Mae)	in terms of selling 'green', benefits need to be stated upfront; ducate the consumter; LEED
Tomasulo, Kathy	Easy being green	discusses the use of recycled/ renewable materials in green construction	the use of recycled/ renewable materials as a part of the 'green product'	technology innovation	N/A	details on recycled and renewable materials used
Cook, Hugh	Building green	Conde Nast Building at Four Times Square discussed as a case study in contemporary green design	increased amount of green buildings	technology innovation	N/A	details of recyclable, reusable materials used; additional technology & engergy saving techniques discussed

Stone, Leland Edward	Building green means raising profits	discussion of the Partnership for Advancing Technology in Housing (PATH) program	volunteer-based programs	N/A		goal of program is to bring attention to promising but little known technology to reduce lead time between product development and intro ino marketplace
von Paumgartten, Paul	Building green	factors in what is considered green	popularity of green building increased	technology innovation	N/A	deals with the product; mentions Johnson Controls Brengel Technolgy Center; impacts on individuals, automation, integrating green and the costs of 'green'
Crockett, Jim	New York mulliing over tax credits for green buildings	NY and its proposed bill to provide a tax credit for green buildings and its tenants	legislation that favors green building (provide incentives	incentives for builders to build green and for tenants to request green buildings	legislation in favor of green building	details of the obligations of the tax credit
Traugott, Alan	Green building design = high performanc e building design	discusses the role of gov. agencies (local & state) and how they impact the marketplace for green buildings	gov. agencies supporting green building trends; increasing the role of the engineer and the engineer's interaction with the architect	manufacturers and corp. havre also recognized a responsibility to be good citizens and empraced idea of sustainable design not just because it is the right thing to do, but not doing it has longterm neg. effects (market implications & liability)	gov., utilities are promoting green building	list of federal, state and local agencies who participate in green building programs; def. of green building; also discusses investments in technology (buildings being 'smarter' flexibility); engineer in a similar role as the supplier?

Lurz, Bill	Brownfields can be golden	discusses the method of cleaning up brownfields	cleaning up brownfields in order to save energy	N/A	N/A	another technique; refers to the product or proces?
Strom-berg, Meghan	NYC high rises to be built green	discusses the Battery Park City high rise in Manhattan	contractors competing despite tough green requirements	good for individual companies; good PR and good for future business	building code regulations being instituted; gov. regulations	discusses details of Battery Park City and how the project came to be; requirements that must be met
Sedan, Paul	Turning trash into cash	discusses a non-profit org. called WasteCap Wisconsin and their efforts to help builders dispose of waste	using recycled materials	N/A	programs can help bear burden of meeting regulations	details of the WasteCap Wisconsin program
McLeister, Dan	Green Building Guide' creates marketing tool	discusses a market driven rating system and the Green Builder Program	market driven rating system	builders respond directly to consumers and not gov. regulations	e.g. of a volunteer-based program	details of the requirements builders in the program must meet; breif discussion on the document
McLeister, Dan	The technology of building	discusses alternative materials used in building homes instead of the traditional wood	using alt. wood products as a result of unstable wood prices	cost	market prices of the wood can drive builders to use alt. materials	
Farns-worth, Christina B.	Re-imaging the future	discusses four green housing developments	green housing developments	cost; good PR	policy implications; consumer and market pressure	details on each housing development profield in the article; how the homes were designed; eco and saving methods; technology used;

Matesi, Ann	How to source wood grown in an eco-friendly manner	discusses certified wood products	using certified wood products as a means of sustainable green building	those that use certified wood - it is a superior product, cost savings, market niche; those that don't - don't like to use products that are unfamilar to them?	market advancement; suppliers impact builders, but buildrs also may look for suppliers who sell certified wood	Good Wood Alliance and their efforts to educate consumers on the suppliers of certified wood; Paragon General Contractor & Cabinent Maker builder who uses EcoTimber International
N/A	Spectrum Skanska sets new green standard	builder received ISO14001 certification	using regulations as an incentive to build green	revamp corporate culture and the in-the-field building practices	legistation; also has market implications	Spectrum Skansa first building firm to recieve ISO14001 certification; brief descripton on the process
Bady, Susan	Teaching kids about environmen tal building	discussed a free educational program that teaches children about the buildng process	educating the public about environ. building	N/A	increased consumer demand will change the nature of the building industry	details of the program sponsored by the National Association of Home Builders
Bady, Susan	Fannie Mae/NAHB launch effort to develop 'Green' mortgages	disccues Fannie Mae and NAHB's efforts to increase green building	pilot programs for green building in lieu of	N/A	financial incentives for builders to participate; pilot programs	Fannie Mae is also providing an additional $100 mil. for investment in initiatives that test new housing finance products
McLeister, Dan	1998 Achieveme nt Awards: Kurowski leads the way to building green	a building company receives recognition for their green building practices	education public on green building; creating more of a market for green building	N/A	markets impact builders (advertising)	advertising campaign to increase green building;

McLeister, Dan	Voluntary programs allow head start on energy regulations	discusses builders joining voluntariy green building programs	voluntary green building programs instead of traditional regulations	allows builders to come up with green building technology before they are required to; financial incentives	takes place of traditional regulations;	lists programs
Power, Matthew	Building green for less green	discusses the argument that building green is less expensive	programs in which builders can base they can learn from	N/A	N/A	discusses a prototype and details of that prototype; states builders don't want to change because competitors will market against it
N/A	Environmental protection is SOP	discusses advancements made at Anderson Corporation	change in corporate culture?	making environ. practices apart of the norm	N/A	seems like an advertising ploy to increase business

Appendix 3: Automotive Industry Major Trends and Factors

Industry	Major Trends	Major Internal Factors	Major External Factors
Automobile			
	Trend of creating new low-emissions vehicles in general	Leadership changing in general	Increased pressure from regulations, green groups, competition from other manufacturers
	Development of new technology for vehicles themselves (hybrid, fuel cell, electric, etc.)	Manufacturers want to be leaders in the green movement (good public relations means more money earned and better political standing	good PR for consumers and politicians to see; also inspires the competition to develop more 'green' technology
	Development of new technology for manufacturing (recycling parts, using different paints, using carpet that is more bio-degradable)	Manufacturers and suppliers may want to be the first to create such technology that they will be able to patent the technology (more money)	Increased competition between the US Manufacturers and Japanese Manufacturers - race to be the 'greenest'
	Auto-manufacturers putting pressure on suppliers to develop more eco-friendly materials; suppliers getting started on creating eco-friendly material in order to be able to sell to manufacturers	Manufacturers are changing the way they do business in terms of putting more of an emphasis on green technology; has to be in the mind-set of the engineers and the workers; making green cars and green	N/A
	Auto manufacturers are developing programs with other manufacturers and the government to inspire green technology (e.g. Canada)	N/A	In lieu of being pressured into meeting regulations, auto manufacturers are initiating programs on their own to beat governmental agencies to the punch
	Auto makers are using standards and regulations (ISO14001) as an incentive to use green technology	fosters a better work environment (happier workers means better production)	N/A
	Financial incentives to use green technology (pay-back programs, looking at green technology as a way of saving money	same as above	N/A
	Development of a rating system which judges how 'green' a car is based on a number of criteria	good PR if the vehicle does well in the ratings	N/A
	Development of methods to attract more consumers to buy green cars or cars that use more green technology	N/A	e.g. In Calif., regulations state that 10 % of cars sold must be "green cars'

Appendix 4: Building Industry Major Trends and Factors

Industry	Major Trends	Major Internal Factors	Major External Factors
Building	The building industry, in general, is increasingly employing more green technology	In general, the culture of the building industry is changing in that green technology is being adopted more widely and more readily accepted	N/A
	Development of a national rating system for judging buildings that have used green technology	Rating systems can be used as an incentive within a company as those using the best green practices will be 'rewarded'	Ratings systems can also be used to develop policies
	Development of standards that require green technology be used (e.g. 9 new buildings in Manhattan must be built using green technology)	The building industry will be subjected to meet more standards set by federal, state and local laws which dictate the amount of green technology that must be used	N/A
	Debate over the question 'what is considered green' moving in two directions: 1st development of a set of guidelines that any builder can use; 2nd movement that states 'green' is what is defined by the builder	1st, having a set of standards would mean builders would not have the same freedom as if they were allowed to develop their own standards; however, it may aid the builder if there is a set of values that state what 'green' is; 2nd, if builders are allowed	N/A
	Corporation are dictating that builders use green techniques; builders are placing the burden on suppliers to provide green technology as well	Corporations are wielding their power in order to bring about change within the building industry; the building industry must then change its attitude and techniques regarding green practices in order to attain and maintain clientele	N/A