Why Do So Many Good Assembly Plants Close? Toward a New Plant Stakeholder and Total Lifecycle Management Strategy

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Abstract

A strategic approach for managing stakeholder interests is critical for global assembly plant site development and management. Using data culled from 1,214 articles on 35 notable assembly plant closures in the automotive and heavy truck industries from 1995-2018, this paper documents both the stated rationale and the stakeholder impact of each closure. A novel strategic planning and decision-making framework then offers some guidance for plant site development that leverages current thinking about industrial lifecycle and stakeholder-driven management strategies. The resulting framework informs some practical guidance for both current plant managers and the heads of global manufacturing strategy who wish to begin the process.

The Puzzle of Assembly Plant Closings

Despite increasing manufacturing competition and improvements in global manufacturing productivity in recent years, it is unclear why so many global assembly plants that had once been models for operational excellence now cease to operate. It is also puzzling that in a global manufacturing environment that espouses lean production practices to optimize supply chain resources, there is such a short lifecycle for many assembly plant locations. This practice would appear to contradict the underlying principles

of lean production (e.g., waste elimination) and supply chain best practices (e.g., develop long-term supplier relationships). While there has been an exponential growth in research on operational sustainability for economics, environment, and society in recent years,[1,2] there is little informed practical guidance on how to develop the strategies for sustaining plant site competitiveness. Yet, determining the correct plant location decision is critical for firms to survive in an era of rapidly shifting global conditions.[3]

The goal of this paper is to both study the underlying motivations for several high-profile assembly plant closures and propose a comprehensive framework for managing plant site competitiveness. Sustainable strategic management is the process by which an assembly plant manager or head of manufacturing strategy for a multi-national corporation (MNC) takes to ensure the long-term adaptation of its plant site to its surrounding environment.[4] We offer that managers of assembly plant locations can build the resources that will likely promote sustained operational competitiveness if they take on a "managing for stakeholders" perspective in their long-term and day-to-day strategic planning and decision-making processes.[5]

With both increasing global competition and rise in political protectionism and localization,[6] developing existing assembly plant locations for next-generation production has become a critical concern for many MNCs, national and local governments, communities, and plant workers. Industrial ecology studies have argued that managers should balance economic profitability, social and environmental awareness concerns to extend the lifecycle of many consumer-driven products and services.[7] For a particular plant site, sustainability can simply be maintaining its ongoing operations and competitiveness. Across all production systems, the notion of operational sustainability can be linked to lean production principles emphasizing waste-reduction while at the same time capturing and creating more value from an economic system.[8]

Because assembly plant stakeholders invest substantial time, accrue capital, invest in people and communities, and build goodwill at these industrial sites – they develop under the assumption that the plant site is sustainable. The long-term accumulated capital and expenses are always higher than the short-term cost-savings from terminating production, so it is unclear why MNCs fail to use alternative business development approaches to prevent closures and protect their long-term investments. MNCs may close plants as part of several strategic challenges in the business environment. The most obvious being demand shifts affecting capacity needs, cost structure, and increased competitive pressures.

Assuming the parent company views its manufacturing network as part of a supply chain system, a plant's strategic value to the MNC will change

with the business environment. A single assembly plant within the multi-plant network has, or at least had at some point in time, a strategic or a tactical role in the greater manufacturing system. Developing a better understanding of how MNCs react to environmental changes might explain why seemingly high-performing plants within a network might close while other, poorer performing plants remain open.

While past studies have been useful in understanding plant closures and their impact on stakeholder groups, industrial ecology literature has argued for moving studies from merely describing assembly plant ecosystems towards offering a more prescriptive framework for assembly plant managers to implement.[9] Such an approach would broadly connect socially responsible global supply chains to multiple stakeholder groups.[10] As such, there has never been more of a need for an informed framework to help improve plant managers' understanding of specific managerial strategies and tactical approaches for managing the competitiveness of an assembly plant site.

Review of Notable Assembly Plant Location Failures

To develop a base understanding of the motivations and impact for different plant closures, the authors generated a list of notable assembly plant closures in the heavy-truck and automotive industries. This was done by conducting a reference/cross-reference search on *The Wall Street Journal*, *The New York Times*, and *International Associated Press* and *United Press International Business Wire* articles (1995-2018) through Lexis-Nexis Academic and the Factiva Dow Jones Database. The resulting articles were then used to construct Table 1 using the search terms: "assembly plant closure"; "plant closure"; "trucks"; "automotive"; "Renault"; "GM"; "Volvo"; "Volkswagen"; "Daimler"; "Chrysler"; "Ford"; "Fiat"; "Citroen"; "Opel"; "Toyota"; "Honda"; "Freightliner"; "International" to generate links to 1,214 articles discussing major plant closures in this industry. For each closure listed in Table 1, this content was used to examine the Multi-national corporation's (MNC) stated rationale for closure, any effects on workers and the surrounding community, and the dollar impact of the closure. Each initial article stream was further examined to make sure that it was related to a shutdown in the final assembly plant in the heavy truck and automotive manufacturing industries, that it was not reopened during the time period we examined, and that there were more than 5 published media articles written about the closure.

Table 1 summarizes the 35 notable auto and heavy truck assembly plant location closures from 1995-2018 identified from the analysis, along with the company stated rationale for each closure. From this analysis of articles, we further grouped the companies stated rationale for closure into five distinct

major categories. The largest category was either that the MNC closed the plant due to "under-performance" (36% of cases) or "company downsizing" (32% of cases) reasons. In a similar manner, we recorded the major stakeholder impacts, including employee layoffs in both the company and associated supply chain, as well as the stated economic impact of the closure.

Table 1. Notable automotive assembly plant closures 1995 – 2018

Company and Plant	Years of Operation	Year Closed	Company Stated Rationale for Closure	Documented Stakeholder Effects
GM- South Korea	22	2018	Downsizing	2,000 workers (A)
GM-Venezuela	68	2017	Underperformance/Government seizure	2,700 workers (A, B)
GM-Holden	54	2017	Underperformance	2,700 workers (A)
Ford – Genk Body and Assembly, Belgium	50	2014	Downsizing	4,300 workers (A)
Volvo-Uddevalla Plant (Sweden)	24	2013	Underperformance	600 workers (A)
Ford – Southampton Transit (UK)	102	2012	Product-line issue or discontinued	1,400 workers (A) Plant relocation to a newer site in Turkey (B, C)
Toyota - NUMMI	28	2010	Obsolescence, Downsizing, Supply chain	4,700 workers (A) 25,000 supply chain jobs (B) $2.3 billion (C)
Opel (GM) - Belgium	85	2010	Downsizing	2,600 workers (A) 8,300 supply chain jobs (B)
GM – Wilmington	62	2009	Downsizing	550 workers $528 billion taxpayer money (A,C)
GM – Oshawa	44	2009	Underperformance, Downsizing	2,600 workers (A)
Daimler – St. Thomas	17	2009	Underperformance	2,300 workers (A)
Chrysler – St Louis	50	2009	Obsolescence	2,400 workers (A)
GM – Moraine	27	2008	Underperformance, Downsizing	2,300 workers (A)
Chrysler – Newark	51	2008	Underperformance, Product-line issue or discontinued	2,100 workers (A) $6.8 million state taxes, $300 economic impact on state (C) 400 supply chain jobs (B)
Aston Martin – UK	53	2007	Obsolescence	600 workers (A)
Ford – Norfolk	82	2007	Obsolescence, Supply chain	2,400 workers (A) $190 million economic impact (C)
Ford – Wixom	50	2007	Product-line issue or discontinued, Downsizing	4,000 workers (A) $550,000 taxes from community (C)
Ford – Atlanta	59	2006	Product-line issue or discontinued, Downsizing	1,950 workers (A) 9% Hapeville tax base (C)

Company and Plant	Years of Operation	Year Closed	Company Stated Rationale for Closure	Documented Stakeholder Effects
Ford – St. Louis	58	2006	Product-line issue or discontinued, Downsizing	1,000 workers (A)
Peugeot - Ryton	28	2006	Underperformance	2,300 workers (A)
GM Lansing craft	18	2006	Product-line issue or discontinued, Downsizing	430 workers (A)
GM – Oklahoma City	32	2006	Downsizing	2,200 workers (A)
Alfa Romeo - Arese	42	2005	Underperformance, Downsizing	800 workers (A)
GM – Baltimore	71	2005	Product-line issue or discontinued	1,100 workers (A)
Ford – Edison	56	2004	Underperformance, Obsolescence	350 workers (A)
Ford - Dearborn	86	2004	Underperformance, Product-line issue or discontinued	2,175 workers (A)
GM – Quebec	36	2002	Underperformance	1,200 workers (A)
Mack Trucks - Winnsboro	15	2002	Underperformance	670 workers (A) $9 million lost retail sales and $450,000 taxes (C)
GM Vauxall - Luton	97	2002	Underperformance	2,500 workers – 500 were transferred (A,C)
GM Buick - Flint	95	1999	Downsizing	1,200 workers (A)
Volvo – Halifax	35	1998	Underperformance, Downsizing	225 workers (A)
Mazda – Thailand	23	1998	Underperformance / Thailand economy	600 workers (A)
Renault - Belgium	62	1997	Underperformance	3,100 workers (A)
Volkswagen and Ford - (Autolatina) Brazil	8	1995	Downsizing	Heavy Ford losses in market, large Volkswagen market gains. The profitability of the market allowed each to produce independently. (C)
Bugatti Automobili – Brazil	6	1995	Product-line issue or discontinued	Launch of new car model coincided with a recession in Europe – bankruptcy. Plant sold to Malaysian buyer who eventually abandoned the facility. (C)

Conducted a reference/cross-reference search using Factiva and Lexus-Nexus articles (1,214 articles, 1995-2018) to construct table using terms: "assembly plant closure"; "plant closure"; "trucks"; "automotive"; "Renault"; "GM"; "Volvo"; "Volkswagen"; "Daimler"; "Chrysler"; "Ford"; "Fiat"; "Citroen"; "Opel"; "Toyota"; "Honda"; "Freightliner"; "International."
Stakeholder effects – (A) # laid-off workers; (B) # supply chain layoffs; (C) estimated economic impact.

A series of 35 vignettes for each major closure in Table 1 documented the rationale and stories behind each event, emphasizing the impact on both the plant site and the plant's stakeholders (Sample vignettes available via supplemental file, upon request). In several examples, top executives decided to close an assembly plant location, even though it had well-

documented proof of operational excellence. Some plants listed in Table 1 had been operational for several generations, some for less than 10 years. In several examples, top executives decided to close an assembly plant location, even though it had well-documented proof of operational excellence. The stories behind their closings illustrate that their negative interactions with key stakeholder groups contributed to their eventual closure. Some brief examples from our review illustrate this point.

Volvo Cars Uddevalla Plant (Sweden) – When it opened in 1989, the plant in Uddevalla was considered the crown jewel of Volvo manufacturing. The plant was created through co-operation between the management and innovators among the production-technicians, trade union representatives, and researchers in industrial technology and work-organization from Chalmers Institute of Technology and the Gothenburg University. It was seen as an expression of a "new Swedish model" with the focus on the workplace, and support of visions, agreements, and expertise from a central level. In 1993, this plant then closed after only four years of initial operation because the global demand for large cars would decline and because it was reported as the 'least efficient' plant within the system. That latter statement remains a subject of debate because the Uddevalla plant's operating metrics were considered to be on par with the conventional Torslanda factory in Gothenburg in assembly-time and quality performance. Shuttering this plant was a strategic decision which seemed to be made by the company which appeared to be independent of specific plant business metrics or employees' input. Later the company formed a joint venture with Pininfarina to build the C70 model at Uddevalla in 2005, but then it decided to terminate the arrangement in 2011 because of low utilization and permanently closed the plant in 2013.[11]

General Motors Lansing Craft (Lansing, MI) - The Lansing Craft Centre was a site of local manufacturing since 1919. GM began producing axel assemblies for Buicks there in 1945. Over the years, GM produced and dropped many different model cars, including the Buick Reatta, Chevrolet Cavalier, Pontiac Sunfire, the EV-1, an electric car, and the Chevrolet SSR truck. The Craft Centre was GM's smallest U.S. vehicle assembly plant, employing 330 members of the United Auto Workers union and 60 salaried employees. Because it was a low-volume production plant, it was much smaller than other GM assembly plants. When the closing announcement for the plant came in 2005, GM reported many factors that led to the closure decision including the age of the plant, the number of models it could make, its proximity to key suppliers, access to highways and railroads, and the company's relationship with local union leaders. Union leaders, in particular, had negotiated with GM to convert the plant into other manufacturing uses.

In March 2006, the final SSR model came off the assembly line, and the plant was demolished beginning in 2008. Faced with crippling high labor, pension, health care, and materials costs as well as sagging demand for sport utility vehicles, GM had little choice in restructuring its manufacturing network as it closed nine other facilities in 2005-2006. This decision left 30,000 people unemployed, and billions of dollars in negative economic impact.

Daimler Trucks St. Thomas Sterling Plant (Ontario, Canada, 2009) and Portland Plant, (Oregon, USA, 2010). Heavy truck manufacturers anticipated fleet trucking companies to pre-buy trucks ahead of major emission standards changes in the US. That surge never occurred, leaving many heavy truck manufacturers with large inventories. Already facing declining profits from excess capacity, Daimler Trucks North America decided to make a major strategic shift in its trucking lines. It discontinued production of the Sterling brand by closing its Portland, Oregon, and St. Thomas, Ontario assembly plant operations – the two locations that produced the brand. The company had chosen to focus its business model on two remaining brands: Western Star and Freightliner. However, production of Western Star Trucks, formerly produced in Portland, had since moved to a new plant in Saltillo, Mexico, already slated to take over some production of the Freightliner Cascadia in 2009. The remaining Western Star and Freightliner brands were reported to have "substantial overlap" with the Sterling heavy- and medium-duty models. Closing the St. Thomas and Portland plants reduced global capacity by 20%, reflecting lower market expectations. Because executives at Daimler Trucks did not do the planning necessary to extend the life cycle of the Sterling Trucks brand, the stakeholder groups in the impacted plants and the surrounding communities bore the brunt of the resulting closure decision.

A new management framework would use both an understanding of both stakeholder-groups and industrial ecology to guide plant life cycle planning and development. Planning and decision-making strategies would prioritize the concepts of *civic impact*, *operational excellence*, and *industrial footprint*, and would help foster stakeholder-driven relationships based on trust, shared history, and value-creating opportunities. The industrial ecology thinking embedded in this approach would consider lifecycle cost, lock-in, and ongoing reinforcement strategies to help enhance the long-term competitiveness and efficiency of the products and/or services provided by the site.[12]

Figure 1. Key Stakeholder Groups of an Assembly Plant Site Ecosystem

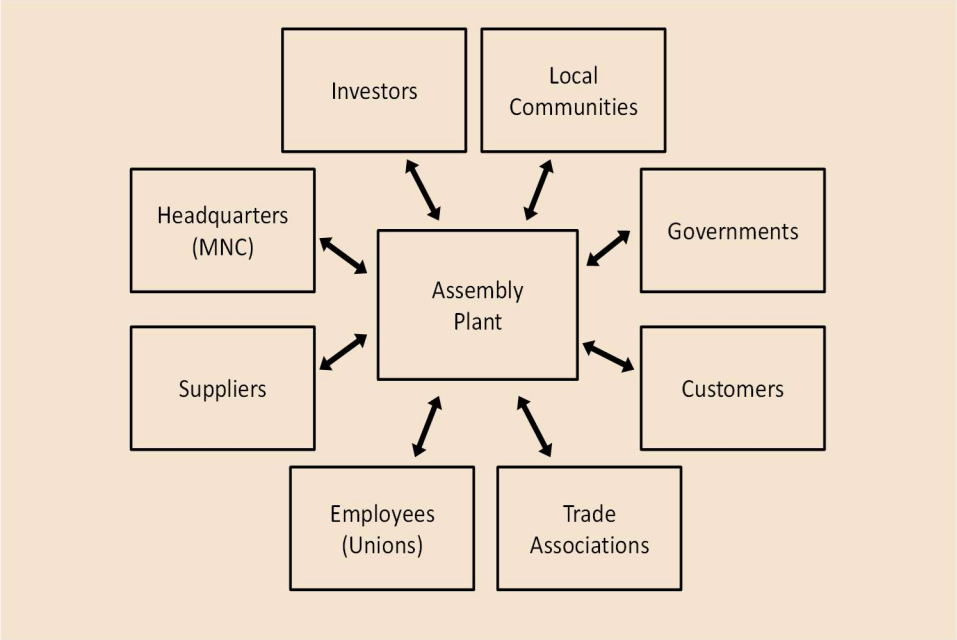
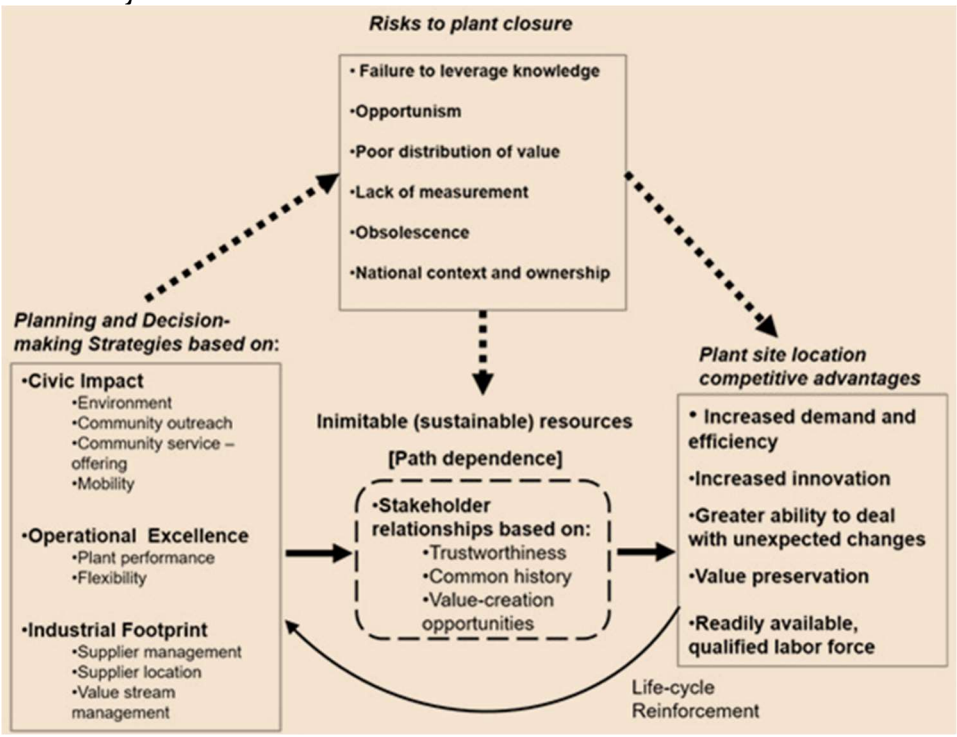


Figure 2. Strategic Planning Framework for Promoting Assembly Plant Sustainability



Note: Solid arrows indicate implied positive relationships/ dashed arrows indicate an implied negative relationship (Basic model structure derived from extant stakeholder thinking[5])

Proposed Planning Framework and the Role of the Plant Site Manager

Figure 2 portrays an alternative planning framework derived from existing stakeholder management thinking, but applies it to understand both the motivations and potential mitigation strategies for plant managers to use in guiding their efforts to develop sustainable plant site locations. Each aspect of the proposed model offers several important strategic insights derived from both the extant academic literature and our review of assembly plant closures. Given the current movements towards bilateral and localized trade negotiations, plant site managers must be concerned with managing the risk factors and politics that may ultimately affect plant closure decisions.

The Risk Factors

Sustained value creation from different stakeholder groups will help mitigate the threats that exist within the larger plant competitive environment. The fair and reciprocal treatment of the key plant stakeholders in this regard is suggested to be a better basis for firms to respond to crisis, external risks, or potential disruptions. An example of this phenomenon of reciprocal treatment might be the willingness of assembly plant workers to appeal to plant "brand loyalty" or their willingness to work overtime, which may ultimately contribute to surviving a crisis. However, if plant workers perceive an imminent shutdown of a plant facility, they may engage in behaviors that damage performance.[13]

Figure 2 further notes the specific risks to plant location failure and closure decisions derived from the review of the notable 35 MNC plant closings: *Failure to Leverage Knowledge, National Context and Ownership, Opportunism, Poor Distribution of Value, Lack of Measurement,* and *Obsolescence.*

Failure to Leverage Knowledge. How does one grow and leverage knowledge so that it is not only a tool for an individual plant, but makes that plant a key component in the global deployment of that tool across all other plants, and thus, by doing so, creates a sustainability factor for the plant? For example, the production information system for Volvo Heavy Trucks, called Sprint, was created by the Ghent, Belgium Volvo Plant in the late 90s, and is now the common tool used by Mack Truck and all other Swedish and French production facilities. Another tracking tool, called Co-Pilot, was also developed by the Ghent Plant management. This facility has leveraged its knowledge of information and tracking systems to make it invaluable to other plants throughout the organization. The ability to re-create that

concept is an unconventional way to introduce sustainability. These things will never show up in KPIs and are rarely a directive from the MNC.

Role of the Plant Site Manager. Plant managers tend to go into stability mode rather than exploring new initiatives and ideas because they believe it is the plant metrics that determine performance. They promote "simplicity" and avoid taking chances instead of immersing themselves and the plant in diverse sets of ideas. Ironically, this strategy taken by the plant manager to promote sustainability makes them more vulnerable because nothing distinguishes their plant from others with similar functions.

To promote sustainability through the leveraging of knowledge, the plant manager must define people's roles to engage in the type of activities that will result in free information exchange environments. Plant managers can either create environments that choke innovation and creativity or facilitate an organizational climate that reaches out to people to emphasize entrepreneurship and innovativeness. Plant managers must be passionate about creating the appropriate environments that promote creativity and innovation and take steps to stimulate the development of such a culture. Part of the success of leveraging stakeholder knowledge requires a plant manager with the appropriate mastery of internal sales and marketing to convince the entire group that a solution they have developed is an appropriate solution for the entire group. Sites that are better at developing the intellectual spin-offs will do it more than just once and are placing themselves in a highly competitive position.

National Context and Ownership. The location of corporate ownership or the location of the MNC headquarters can influence the sustainability of a plant beyond the plant manager's ability to influence. Whether to avoid political pressures or customer pressures, an MNC may choose to close an out-of-country plant rather than an under-performing domestic one. An example of this from the review is the GM Opel plant located in Belgium. This plant makes the same car platform as a plant in Germany, as well as in England. From purely a business metrics perspective, the UK plant (Elsmerport) should have been closed. However, at that time, the market-share of Opel in the mainland and continental Europe had deteriorated badly. In contrast, market share in the UK was strong. Despite being a German automobile, Vauxhall (which is a renamed Opel) was viewed as an English brand because of its success there. Associations in Britain argued that one of the plants in Germany or Belgium should be closed rather than in the UK because the market conditions were better, and brand identity was stronger. The UK brand identification arguments won, and the UK plant was sustained. Then the decision became between the Belgium plant and the

German plant. Even though the Belgium plant had better metrics, the car was a German brand, and it was decided that the Belgian plant should close. When the relationship between the product and the country is strong, it provides a degree of sustainability even though business metrics may be unfavorable.

Role of the Plant Site Manager. Even though the decision to shutter a plant may be perceived outside the normal ones a plant manager can make, a true plant "leader" can have influence in the process by building relationships between the plant and the government. They may also offer alternatives for how the plant is used, as well as call on political relationships to use their persuasion to steer the decision in a different direction. For the sustainability of the plant, the manager must build the political bases and influence structures to help build resources in the plant. Plant managers should also understand the importance of relationships with the trade unions that may directly or indirectly affect the plant shutdown decisions because of the position and/or power of trade unions within the ecosystem. This influence is evident in the cases of Bochum versus Antwerp, NUMMI versus non-unionized Toyota plants in the US.

Opportunism. Opportunism is perceived when an actor within a stakeholder system benefits from the behavior of others without contributing anything to the relationship themselves. MNCs often have asymmetric information vis-à-vis other stakeholders in the assembly plant ecosystem and may use this information advantageously to advance their interests. If opportunistic behaviors are perceived by other stakeholders in an assembly plant ecosystem, they may begin to perceive the MNC as untrustworthy. Several of the assembly plant closures we examined also seemed to exhibit "last-period" opportunistic behavior, where critical information was withheld from key stakeholders to make the decision "easier" to close the plant. Research has shown that opportunistic behavior is most likely to occur when there is an absence of internal or external controls, opportunities for gain at minimum cost are observed, or decisions must be made under external pressure or perceived urgency. Stakeholders will perceive less opportunism is present if decisions can be made with consistency, and are made without distorting or withholding information critical for long-term decision-making.

Role of the Plant Site Manager. Opportunism may come from both the internal or external stakeholder groups. In an MNC, plants can stand out by selectively addressing and solving problems faced by multiple sites within the stakeholder group and leveraging them as previously discussed. Furthermore, plants can increase their sustainability through internal

opportunities by accepting projects needed by the MNC. Two examples: At the Volvo Heavy trucks Plant in Ghent, Belgium, they took advantage of "Intra-Group Opportunism." The group was having discussions about who should be the outside supplier for tire rim assemblies. The plant manager built a business case for the project to be done in house. The first machine purchased was for internal plant consumption, but after it was successful, the group of stakeholders asked why the plant could not provide assembled tires and rims for other sites, and the operation was expanded. Eventually, such projects show up in business metrics and build the legacy of the plant, which contributes to sustainability.

Poor Distribution of Value. Perceived justice or fairness goes beyond traditional economic motivations in that the voluntary component of a stakeholder relationship plays the principal role in determining overall relationship value. In extant industrial management theory, perspectives of justice have been shown to play an important role in enhancing the value of supply chain relationships and their broad performance impact.[14] Stakeholder-driven thinking has also concerned itself with distributional equity in terms of the fairness of outcomes or rewards. Stakeholders in any industrial system are concerned with balancing effort and reciprocity.[15] If poor value distribution is perceived, then this causes a negative impact on creating long-term relationships with key stakeholder groups, and it will cause them to seek out alternative, individual economic opportunities that may run contrary to enhanced plant site development and long-term sustainability.

Role of the Plant Site Manager. To improve justice or fairness in the value distribution, firms need to incorporate more factors beyond the traditional operational/financial metrics.[16] For example, managers may need to consider some behavioral factors where fairness plays an important role in developing and maintaining relationships among stakeholders. Indeed, operations management can be influenced by human behaviors from different stakeholder groups, and judgmental decisions are common in practice.[17] This consideration requires firms to develop an organization model that is truly supportive of participative management. Sometimes, firms may even need to sacrifice short-term profit for the benefits of other stakeholders to develop long-term competitiveness. In some cases, maintaining fairness in value distribution can be the first concern[16]. As mentioned earlier, managers should take into account the union management relationship where equality and involvement may matter for decision-making. This is because the union-management relationship is largely a unique and important aspect of relationship management in the auto/truck industry. Directive/top down

management may yield short-term results, but in the long-term will result in an environment of hostility and resentment and disinterest beyond the paycheck. The key to success can be that firms should maintain a high level of the visibility of the plant manager to the employees. It is important to align the incentives and efforts among all managers and employees inside a firm consistent with this strategy. In addition, relationship with localities is another important relationship, which brings aspects such as permitting, taxation, land development, infrastructure, public messaging, etc. into the value-creation relationship.

Lack of Measurement. Total Quality Management literature and sage dictates, "If it can't be measured, it can't be improved."[18] This concept is not completely ingrained in modern manufacturing, but every assembly plant has key performance indicators (KPIs) which it uses to determine plant decision-making effectiveness. Measurement of this kind connects behaviors and actions with operational excellence, so it is a very conventional part of successful business and plant management. However, it is difficult to measure the total value-creation to all assembly plant stakeholders or that value provided by effective management of the plant stakeholder relationships. "Value-creation and appropriation are inseparable" within a greater organizational system,[19] but many existing profit or shareholder models used to measure performance may not be sufficient for capturing the benefits or value of stakeholder engagement.

Role of Plant Site Manager. The plant manager needs to have all the metrics, structures, deployments, and reporting, and feedback systems in place. In short, all the traditional tools must be there in order for plants to be successful. The plant manager can never forget the importance of hitting the metrics because basic performance allows the plant manager to drive other things. A low performing plant will have difficulty justifying doing the other things. A high performing plant that does the other things will become a more sustainable plant. A high performing plant that does not do the other things will be shut down eventually and die like all the rest. This is a necessary condition for plant site sustainability, but not a sufficient condition.

Obsolescence. Obsolescence can threaten plant closure comes from a number of sources: 1) functional obsolescence – plant infrastructure wear and tear; 2) technological obsolescence – antiquated methods/processes/ routines/technologies to produce products or services in the dynamics of technology innovation; 3) economic obsolescence - loss in value resulting from influences external to the plant (e.g., industry evolution); or 4) product

obsolescence – new products that supersede the functions of the old product and become preferred.[20] Regardless of the source, plants risk closure if obsolescence occurs. Rarely do plants facing closure for obsolescence have superior business metrics. For example, the Mack truck plant in Macungie, PA, had all the appearance and operational metrics of a rundown plant. However, the plant made a significant business case for a $25 million upgrade and announced additional investments of $70 million in 2017. The rationale for this new investment was driven by the fact that the plant produced the entire product range of Mack branded trucks and it was the largest such investment made in the plant since the plant was built in the 1970s.

Role of Plant Site Manager. The biggest risk to obsolescence for plant leadership is complacency, because the plant is not replacing, not updating, and not innovating—all sure steps toward closure. To avoid obsolescence, plant leadership must be efficient and capable in securing funding from the MNC to keep the plant updated. Building a successful business case for plant upgrades is a necessary skill for plant leadership. Business cases are not just for new initiatives, but to allow the plant to replace what it has. Lack of investment is reflective of the lack of competence in the plant leadership to successfully request money, to tell a story, to paint a vision of the future with the investment. Plant manager must market their ideas and sell their ideas to the MNC. Plant manager must create passion in those who have access to the Board of Directors who must approve large investments.

Modern Strategies for Managing Plant Stakeholders and Lifecycle Assessment

The "approaches to managing stakeholders have specific costs and benefits and that both can be the source of sustained value creation when supported by an appropriate set of organizational practices."[21] However, the specific organizational practices that can be developed to promote stakeholder-driven plant management strategies have not been the focus of extant study. From our review of notable plant failures, stakeholder management, and extant literature on the topic, we argue there are three general domains of strategic planning and decision-making focus that are particularly important for developing stakeholder resources for plant site strategy - *Civic Impact*, *Operational Excellence*, and *Industrial Footprint*.

Civic Impact

When plant managers consider the civic impact, they are focusing on the more intangible aspects of their stakeholder relationships. The civic impact is characterized by *the actions the plant manager takes to develop path-dependent relationships with both community and government leaders*

through actions that share opportunities and/or relieve constraints. The relationship between a plant's competitive environment and public policy and regulation from community or government stakeholders can alter the nature and size of the market for the plant's products, and also will alter the cost structure of the plant, through tax incentives, workforce training, grants-in-aid, or through its environmental protection and zoning efforts. Potential areas of focus to such an approach to management would be a concern over the environmental impact of the plant, for example. Moreover, an emphasis on community outreach and a focus on community service would help build a sentiment of reciprocity that would become evident above and beyond traditional economic or transactional stakeholder interactions. Scholarship has noted that the reputational capital of a firm is "an example of a resource that is intimately path dependent."[22] Moreover, an emphasis on plant site mobility – managing the degree of interference between the plant site and the surrounding community - may be a critical intangible factor that might be necessary for building these types of relationships.

Civic impact can also be related to social capital. Improved social capital can help firms and facilitate collaborative engagement and an organizational learning search of internal and external information or experiences.[23] Unless all the partners work closely and align the incentives to coordinate efforts, firms cannot achieve any success in improving social performance to an extended degree. A better relationship can help firms develop social capital that strengthens the relationships between the firms and other stakeholders. Overall, it enhances firms' operational licensing and social legitimacy in the market.

Operational Excellence

Research has considered a plant's operational performance (or operational excellence) to be a critical and highly tangible factor in manufacturing strategy and assembly plant development. Typically, the research considers that operational excellence in manufacturing come from *operational excellence in the four key competitive priorities or dimensions of manufacturing excellence: Quality, dependability, flexibility, and cost*. Quality is considered the foundation upon which all other competitive capabilities related to operational performance are built. The degree to which it achieves benchmarked standards in quality may also make the plant a more critical component of the MNC production system, as well as a source of pride and ongoing commitment from the plant's key stakeholders. Moreover, plants with excellence in dependability may be able to cover the shortfalls of other plants and become more likely to leverage the knowledge and skills of their workers to benefit the MNC and its global operations.

Flexibility is becoming a more important dimension of global manufacturing and supply chain operational excellence as customer demands increase for more customized products and product-related services, which are generally either expected or rewarded by the market. Improving a plant's flexibility may allow it to adapt more readily to dynamic market shifts or capacity needs from the surrounding network. Since cost-improvement is linked closely to plant or firm's financial performance, it is perhaps the most important dimension. More cost productive plants are likely to be more effective at managing inventory, internal constraints, and achieve competitive advantage over less productive plants.

On the other hand, poor operational performance is likely to demand concessions for key stakeholders in areas such as pay and benefits, hiring, and development spending, and simultaneously works against building trust, exploiting opportunities, or sharing knowledge. An example from our review is Ford's Way Forward plan. In 2005, Ford operated a loss of $1.6 billion, and the company struggled to compete with Asian competitors. In order to reduce costs and increase profitability, Ford shut down seven plants, worker salaries were decreased significantly, and low performing unprofitable car models were made obsolete. Ultimately, the global restructuring impacted about 20-25% of Ford's North American workforce.

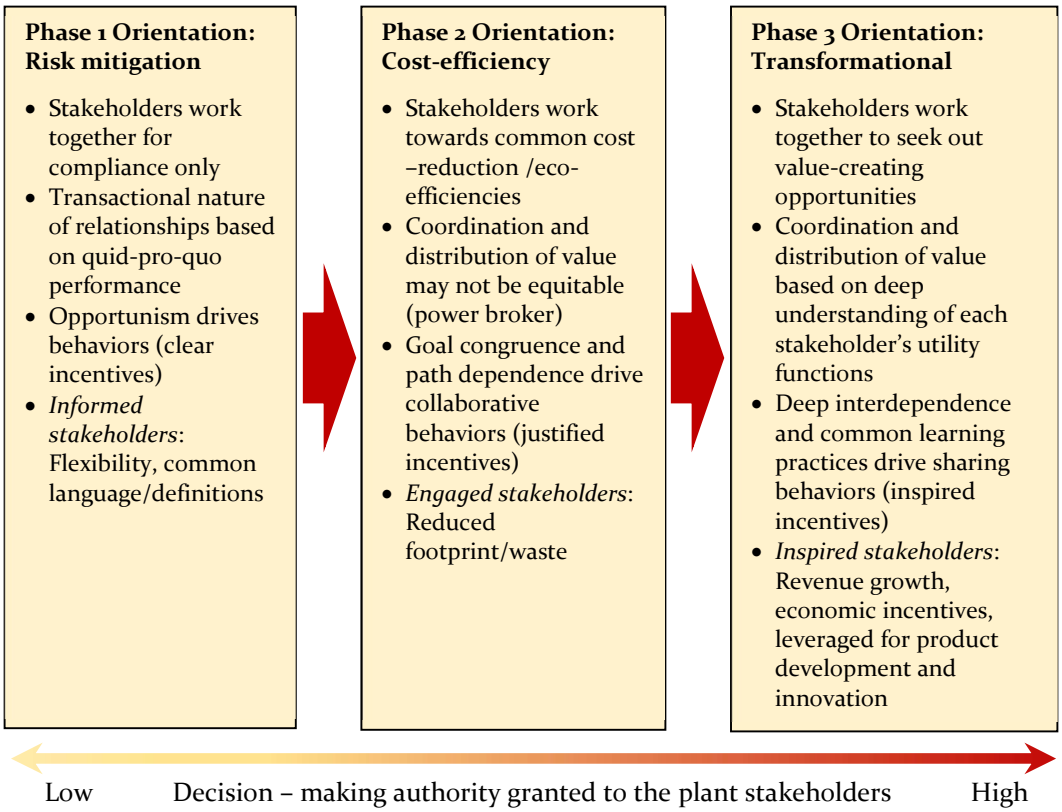
Industrial Footprint

Plant managerial and decision-making strategies focused on building a comprehensive industrial footprint are concerned with *the co-location and development of buyers and suppliers within a community or regional support network to improve collaborative and monitoring efforts*. Strategies such as profitable proximity sourcing, which connect the plant with local sources of supply anchor, can offer several critical advantages. Isolated plants from the supply base have a higher cost basis and little opportunity to reduce lead-times or co-locate to move from push to pull systems in their operations. In the automotive and heavy-truck supply chain, assembly plants are often held accountable for supplier malpractice.[24] Automotive companies like Honda, for example, hold ongoing meetings with suppliers to study and learn about issues such as employee development, distribution and quality system management and new materials.[25] In this regard, supplier development – defined as the efforts on part of a buying firm to enhance the supplier's performance[26] serves a key role because the plant's suppliers can be seen as partners in the effort to build a culture that simultaneously entrepreneurial, innovative, and learning-oriented. These types of supplier development efforts are most likely to occur when firms are close in distance and have broad personalized interaction opportunities.

Life-cycle Reinforcement

Once established, stakeholder relationships evolve as part of an ongoing planning and re-development effort. An assembly plant site is part of an evolving ecological system considers that the outputs of the system will serve as a basis for reformulation and future system states. Figure 3 offers a novel approach for plant managers to position their current relationships using lifecycle assessment tools developed from an ecology-based perspective of strategic plant management. Calls are increasing to apply ecological lifecycle assessment techniques for manufacturing companies in objectively evaluating their initial and evolving states of development.[27] Effective stakeholder-driven planning reinforces the plant's stakeholder group participation. However, all plant stakeholders should need not be treated equally, nor will the benefits be immediate. A plant's strategic stakeholder relationships, therefore, is expected to move through phases ranging from an initial state of participation into "next-generation" phases where the key stakeholders take active consideration of and engage enthusiastically with the strategic decision made at a particular plant location site.

Figure 3. Phases of assembly plant lifecycle reinforcement: An industrial ecology perspective



Some Final Recommendations to Plant Site Managers: Refuse to "Go Simple"

The stakeholder-driven perspective presented here is quite different from the traditional input-output management models practiced by most modern plant site managers. Where the closures in our study did occur (Table 1), the surrounding stakeholder groups were viewed mostly as separate and interchangeable parts of a larger plant ecosystem, and the only focus of management was on maximizing plant output (a.k.a. operational performance). Our review of plant closures suggests that on top of the operational requirements, it is perhaps more important to manage the interfaces between the plant, its environment, its broad network relationships (both internal and external networks), its employee behaviors, and many more aspects including its customer base and brand management. The benefits to developing such a stakeholder-driven industrial ecosystem will develop resources that are difficult for others to imitate, at least over the short-term, as well as extend the lifecycle and competitiveness of any particular plant site. We conclude our analysis with three managerial insights for achieving assembly plant sustainability that should be a priority for plant site managers who wish to begin the process:

Managing the intangibles at a plant site is critical. Plant managers should understand the strength of managing the intangible elements embedded within the framework. Managers need to understand the priorities for developing an effective team. For instance, it might be that in some cases, metrics or target objectives are less important than the passion or engagement of the stakeholders within the system, and the intangible components of management are key. For example, at Volvo Truck manufacturing in Dublin, Virginia, 80% of the participants in a workshop attended by plant managers and corporate executives said that these intangible elements are more important for effective management. However, the reality is that plant managers tend to spend most of their time managing operating performance metrics and targets, while they spend less time managing the intangibles. Part of this focus may be because of misaligned incentives handed down from the corporate office that favor these more tangible forms of management over the intangible aspects of plant management. Most people who run plants have backgrounds as engineers or finance people, and most plant manager's career training is centered on managing operating metrics, financial statements, and cost deployment (e.g., the numbers). Our research into closures reveals that often plant site managers develop these concepts to such a degree as that it overwhelms their direction to the expense of the intangible management elements imbedded

in the proposed plant stakeholder framework. In sum, our thought is that plant site managers should focus as much effort towards developing the culture and participatory elements of the framework to be effective.

There should be a prominent plant site sales and marketing role. The ability of a plant manager to market and sell ideas to benefit the company and benefit the plant is underestimated. Given the rapid changes in global conditions, many companies are considering changing their manufacturing strategy and industrial footprint. While related research has largely focused on the role of "place marketing" strategies when the plant location decision is initially made,[28] there is little attention paid to the important role marketing to plant stakeholders once the plant is built. This focus highlights the importance of networking—how the plant site leader connects with others within and outside of the organization. Selling takes place both inside and outside the plant. The goal should be to create an environment where the plant is a sales tool, where the largest portion of workers on the assembly line is the biggest salesforce for the company. The plant site manager can facilitate employee engagement through a number of strategies including showing respect for the individual, sharing plant site information with employees, making sure that plant workers are "in the know" when important visitors come to the plant site, training workers on how to deal with plant site visitors, and publically recognizing employee contributions both inside and outside of the plant.

Decision access should be provided to both internal and external plant site stakeholders. Plant site managers cannot lead a facility and not be intimately present in the facility. This is because sustainability issues related to social, economic, and environmental concerns at a single plant site may be interconnected and have consequences for both external and internal stakeholders.[29] For internal stakeholder engagement, for example, it may be important for plant site managers to develop formal programs for plant workers. This is also part of creating an environment where one can tap into the full intellectual and marketing potential of workers through the organizational structure and empowerment. Passion for people includes breaking down the boxes people are placed in by their positions. The message being conveyed should be the same throughout the plant and embedded within internal plant stakeholders. External stakeholder groups should also be given access to the strategic decision-making process in the plant. A world of more interconnected business networks has increased the emphasis on developing value-creating networks where managers to seek out collaborative partners and to actively leverage their full potential.

Stakeholder value-creation can also increase the ability of the plant to manage environmental uncertainty, as well as give the firm the ability to leverage external capabilities to better service and effectively "respond" to the plant's customers.[30]

In conclusion, we believe that the more plant site managers follow the strategic planning archetype to build intangible resources and path dependencies with key stakeholders, the assembly plant will be likely to cycle through the risks to plant closure towards a position of ongoing competitive advantage. Plant closure risks can be mitigated, inimitable resources preserved and sustained, and more value created for all those who benefit from the site. Given the recent movement in many industrialized economies (e.g., the U.K. and U.S.) towards more nationalistic trade policies that may affect the risk profiles and plant strategies for many MNCs, it is increasingly important for plant sites to leverage their stakeholders to create the most value from their activities. For this to happen, strategy formulations surrounding plant site development will need to develop inspired stakeholder relationships that transform the plant site into an entity that will effectively address the complex problems and future uncertainties that are now at hand. The strategies mentioned in this paper will involve a mindset change for many plant site managers and MNCs. Many plant site managers will continue to "go simple" and avoid taking chances instead of immersing themselves in diverse sets of ideas intended to inspire and motivate external stakeholders. Ironically, we argue that this conservative approach will actually make them more vulnerable to the risks of plant closure because nothing distinguishes their plant from others within the global manufacturing network of the MNC.

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Endnotes

1. Kalkancı, B., Rahmani, M., Toktay, L.B. (2019). The role of inclusive innovation in promoting social sustainability. *Production and Operations Management, 28*(2), 2960-2982.
2. Lee, H.L. & Tang, C.S. (2018). Socially and environmentally responsible value chain innovations: New operations management research opportunities. *Management Science, 64*(3), 983–996.
3. Tate, W.L., Ellram, L.M., Schoenherr, T., & Petersen, K.J. (2014). Global competitive conditions driving the manufacturing location decision. *Business Horizons, 57*(3), 381–390.
4. Chakravarthy, B. (1986). Measuring strategic performance. *Strategic Management Journal, 7*(5), 437-458.
5. Harrison, J.S., Bosse, D.A., & Phillips, R.A. (2010). Managing for stakeholders, stakeholder utility functions, and competitive advantage. *Strategic Management Journal, 31*(1), 58-74.

6. At the time of this article there is a great deal of media focus on the protectionist tone of U.S. national trade policies surrounding the plant location decision. See: LaHucik, K., & Welch, D. (2019, August 6). Taking in just $70 a day, Trump's GM plant savior is in trouble. *Bloomberg.*
7. Elkington, J. (1998). Partnerships from cannibals with forks: The triple bottom line of 21st-century business. *Environmental Quality Management, 8*(1), 37-51.
8. Upadhye, N., Deshmukh, S., & Garg, S. (2010). Lean manufacturing for sustainable development. *Global Business and Management Research, 2*(1), 125-137.
9. Korhonen, J., Von Malmborg, F., Strachan, P., & Ehrenfeld, J. (2004). Management and policy aspects of industrial ecology: An emerging research agenda. *Business Strategy and the Environment, 13*(5), 289-305.
10. Several studies in operations and supply chain management literature have called for more "socially responsible supply chains." See: Sodhi, M.S., & Tang, C.S. (2018). Corporate social sustainability in supply chains: a thematic analysis of the literature. *International Journal of Production Research, 56*(1–2), 882–901.
11. Berggren (1994) provides a particularly useful and widely cited case analysis of this particular plant. See: Berggren, C. (1994). NUMMI vs. Uddevalla. *Sloan Management Review, 35*(2), 37-49.
12. Subramanian, R., Talbot, B., & Gupta, S. (2010). An approach to integrating environmental considerations within managerial decision-making. *Journal of Industrial Ecology, 14*(3), 378-398.
13. Many studies deal with stakeholder motivations in the face of similar risk factors as studied in this paper. The insights from this paragraph largely reference the work of Bridoux and Stoelhorst's (2014) study that builds on Harrison et al.'s (2010) perspectives on how perceived risks drive certain stakeholder behaviors. See: Bridoux, F., & Stoelhorst, J. (2014). Microfoundations for stakeholder theory: Managing stakeholders with heterogeneous motives. *Strategic Management Journal, 35*(1), 107-125.
14. Narasimhan, R., Narayanan, S., & Srinivasan, R. (2013). An investigation of justice in supply chain relationships and their performance impact. *Journal of Operations Management 31*(5), 236-247.
15. Bosse, D., Phillips, R., & Harrison, J. (2009). Stakeholders, reciprocity, and firm performance. *Strategic Management Journal, 30*(4), 447-456.
16. Cui, T.H., Raju, J.S., & Zhang, Z.J. (2007). Fairness and channel coordination. *Management Science, 53*(8), 1303–1314.
17. Kremer, M., Moritz, B., & Siemsen, E. (2011). Demand forecasting behavior: System neglect and change detection. *Management Science, 57*(10), 1827–1843.
18. Peter Drucker cited in Kaminski (2014). See: Kaminski, S. (2014). The need for speed—Can quality and efficiency coexist? *JAMA Surgery, 149*(9), 925–925.
19. Harrison, J.S., Bosse, D.A., & Phillips, R.A. (2010). Managing for stakeholders, stakeholder utility functions, and competitive advantage. *Strategic Management Journal, 31*(1), 58-74.
20. A number of studies have utilized similar categories to describe obsolescence including, Grover, C. & Grover, R. (2015). Obsolescence – a cause for concern? *Journal of Property Investment and Finance, 33*(3), 299–314.
21. Bridoux, F., & Stoelhorst, J. (2014). Microfoundations for stakeholder theory: Managing stakeholders with heterogeneous motives. *Strategic Management Journal, 35*(1), 107-125.
22. Harrison, J.S., Bosse, D.A., & Phillips, R.A. (2010). Managing for stakeholders, stakeholder utility functions, and competitive advantage. *Strategic Management Journal, 31*(1), 58-74.

23. Desai, V.M. (2017). Collaborative stakeholder engagement: An integration between theories of organizational legitimacy and learning. *Academy of Management Journal, 61*(1), 220–244.
24. Benoit, W.L. (1995). *Accounts, excuses, and apologies: A theory of image restoration strategies*. Albany, N.Y.: State University of New York Press.
25. Imai, M. (1986). *Kaizen: The key to Japan's competitive success.* New York: McGraw-Hill.
26. Krause, D.R., Scannell, T.V., & Calantone, R.J. (2000). A structural analysis of the effectiveness of buying firms' strategies to improve supplier performance. *Decision Sciences, 31*(1), 33-55.
27. Mani, M., Lyons, K. & Sriram, R. (2010). Developing a sustainability manufacturing maturity model. Proceedings from the IMS Summer School on Sustainable Manufacturing, May 2010, (pp. 311-321).
28. Ulaga, W., Sharma, A., & Krishnan, R. (2002). Plant location and place marketing: Understanding the process from the business customer's perspective. *Industrial Marketing Management, 31*(5), 393-401.
29. Pullman, M. & Sauter, M. (2012). *Sustainability delivered: Designing socially and environmentally responsible supply chains.* New York: Business Expert Press.
30. Kahkonen, A.K., & Lintukangas, K. (2012). The underlying potential of supply management in value creation. *Journal of Purchasing and Supply Management, 18*(2), 68-75.