

Last In, First Out: A Case Study of Lean Manufacturing in North America's Automobile Industry

Erratum

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Keri Brondo and Marietta Baba's 2010 article published in Vol. 69(3): 263-274 contained the following errors in publication: (1) The title to the article should have appeared as "Last In, First Out: A Case Study of Lean Manufacturing in North America's Automobile Industry," (2) the affiliation of Marietta Baba's joint appointment is the School of Human Resources and Labor Relations (formerly the School of Labor and Industrial Relations, SUR).

Last In, First Out: A Case Study of Lean Manufacturing in North America's Automobile Industry

Keri Vacanti Brondo and Marietta L. Baba

This paper describes a three-year case study (2003-2005) of General Motors' (GM) Lansing Grand River Assembly (LGRA) plant, the first new vehicle assembly plant in North America to be built on GM's Global Manufacturing System (GMS), a globally integrated lean manufacturing model. The paper is an ethnographic journey to understand the LGRA's perceived initial "success" with lean manufacturing. In the study, LGRA's economic performance is related to two Participant Propositions, one connecting performance to the plant's rural workforce and the second predicting performance declines based on the transfer of "other" workers to the plant. Findings from the case, overall, contribute to the literature on lean manufacturing and participatory work processes, describing how organizational and institutional processes beyond the control of a single plant can possibly lead to a breakdown in participatory structures, creating risks for the long-term sustainability of lean manufacturing approaches.

Key words: work, lean manufacturing, organizations, institutions, General Motors

Introduction

This paper explores the prospects for lean manufacturing in the North American automobile industry. Lean manufacturing has been defined as a complex,

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multidimensional approach to making goods that includes specific shop floor practices aimed at reducing waste, designs that enhance manufacturability, timely coordination of the supply chain, close collaboration with customers, and highly disciplined management (Womack, Roos, and Jones 1990; Liker 2004). According to Womack, Roos, and Jones (1990:99), the original concept of a "lean" plant, developed by Toyota, was distinguished by two key elements:

It transfers the maximum number of tasks and responsibilities to those workers actually adding value to the car on the line, and it has in place a system for detecting defects that quickly traces every problem, once discovered to its ultimate cause.

This definition points to the crucial role of production workers, a feature that has become a focus of controversy as the lean manufacturing system diffused from Toyota to Western corporations (Baba 2008; Babson 1995; Vallas 2006a, 2006b).

Controversy derives from relationships among production workers, unions, and management (Vallas 2006b). In the Toyota Production System (TPS), emphasis is placed on reducing cost by eliminating waste and making full use of human capabilities (Sugimori et al. 1977). Yet the diffusion of lean methods often has implied balancing intensified work effort and reduced worker protections with an enhanced role in worker decision making, workplace authority, and increased skills (e.g. self-directed teams). An intense debate has emerged regarding the

consequences of lean manufacturing and whether or not the trade-off actually takes place, or whether workers only experience the downside (Babson 1995; Liker, Fruin, and Adler 1999; Vallas 2006a, 2006b). Less contested is that manufacturing firms face continuing pressure from global competitors to enhance productivity and quality through lean manufacturing methods (Swank 2003).

We describe a three-year case study (2003-2005) of General Motors' (GM) Lansing Grand River Assembly plant (LGRA), the first new vehicle assembly plant in North America to be built on GM's Global Manufacturing System (GMS), a globally integrated lean manufacturing model. GMS resembles TPS in its focus on the standardization of work practices and technology and the elimination of waste in all of its forms (Womack et al. 1990). LGRA began production in 2002 and manufactures four Cadillac models.

LGRA became a leader in luxury nameplate quality production in its first three years, receiving the 2003 silver quality award (#2 plant) and 2004 gold award (#1 plant) in the J.D. Power and Associates Initial Quality Study (IQS), and was named the benchmark (best in class) plant for luxury vehicle production efficiency (or productivity) in North America in the 2005 Harbour Report. During the time of this study, considerable media attention focused on the plant's upbeat economic performance compared to other plants in its class, and there was interest among researchers regarding this initial success, given ongoing debates regarding lean manufacturing and challenges facing the North American automobile industry.

The intent of our study was to shed light on the debate through a contextually nuanced account of lean manufacturing from the employees' perspectives. We were particularly interested in LGRA's perceived economic "success" with lean manufacturing. Were there contextual factors contributing to perceptions in its initial success? Because the study was not conceptualized initially as a problem-oriented project for General Motors, our access to the plant's inner workings was restricted and partial (as is often the case in academic research within corporations) (Baba 1988). As we discovered, our constrained point of view and the necessity of working *with* and *through* designated research partners and specific organizational units within the plant, shaped the initial trajectory of our research and impressions of the phenomena under investigation.

In this paper, we take the reader on our research journey, beginning with the framing of LGRA's perceived performance "success" in lean manufacturing as connected to the plant's rural surroundings, through our discovery of a potential link between the plant's early performance and the role of its initial volunteer launch group, and finally to the possible breakdown in participatory processes rooted in contractually-based employee transfer rights. Findings from the case describe how organizational and institutional processes beyond the control of a single plant can lead to a breakdown in participatory structures, thereby creating

risks for the long-term sustainability of lean manufacturing approaches.

Background

Lean Manufacturing in North America

Proponents of lean manufacturing argue that it represents an opportunity to revitalize American manufacturing through enhanced productivity and quality. Proponents also view self-directed teams as enhancing production workers' abilities to develop and implement new knowledge and skills and combat fatigue and boredom through reclassifying work practices (see Adler 1999; Vallas 2006a). Critics claim the new Human Resource (HR) management practices (e.g., teamwork, job rotation, and enhanced training) are not emancipatory, but instead are managerial tactics used to establish a workforce where employees of equal status monitor and police each other through new lateral structures of coercion (Babson 1995). At the same time, the pace of work becomes intensified as waste is eliminated in all of its aspects, including rest time and extra workers. This makes work more difficult and strenuous, and workers become more prone to injury (Parker and Slaughter 1995). This physical stress enhances mental stress caused by the elimination of job hierarchies and distribution of responsibility for production across the workforce.

Antagonistic governance models often characterize traditional American manufacturing environments, creating persistent challenges for the diffusion of lean methodology (Babson 1995). Some North American facilities have openly resisted managements' efforts to build a model of cooperative or consensual governance through strikes and other forms of disaffection within work groups (see Babson 1995; Fucini and Fucini 1990; Graham 1995; Rinehart, Huxley, and Robertson 1997; Vallas 2006b). Yet, there is little disagreement that global competition appears to require the adoption of some new methods, such as lean manufacturing, to increase productivity and quality. Many top competitors in the automobile industry already have adopted such methodologies (Liker 2004; Womack, Roos, and Jones 1990). The GMS is GM's model.

The Significance of the GMS

GMS operates on a team-based work system, unlike prior mass production systems based on a one person-one job structure. GMS departs from other team-based models in a number of ways, most notably through reward and recognition programs that empower hourly employees to suggest ways to improve standardized work practices and measure team performance levels themselves (Block and Berg 2009). All problems and decisions—from the location of a parts bin to whether or not to scrap a car for paint defects—are root cause analyzed and solved by these work teams. Both salaried and hourly employees work in cross-functional teams, and mea-

asures are introduced to eliminate hierarchical labor divisions (e.g., the use of common clothing, greeting one another on a first name basis, and standardized work spaces).

The significance of production workers is reinforced through the weeklong, mandatory GMS training in which salaried and hourly personnel jointly participate. GMS is presented in the graphical metaphor of a molecule, a dynamic system in which all parts are integrated. Therefore, for GMS to be effective, employees must embrace every aspect. Salaried personnel are told that their sole purpose in the plant is to provide support for the production workers. Thus, the plant's organizational concept is presented as an inverted triangle; hourly workers are at the top (producing value) supported by management at the bottom (being "overhead.")

As a lean production system, the elimination of waste to reduce cost is central. There are seven types of waste: (1) corrections-errors, (2) over-production, (3) material movement, (4) motion, (5) waiting, (6) inventory, and (7) over-processing (i.e., do what is necessary, but no more). The reduction of waste is the responsibility of everyone in the plant, and the standardization of work practices facilitates waste reduction.

Collective Bargaining and GMS

One of the most intriguing aspects of LGRA and GMS is that its launch in North America required a new local labor contract with the United Auto Workers (UAW) to integrate the GMS philosophy into the foundation. The new contract permitted flexible work roles for the hourly workforce and eliminated numerous job categories deemed responsible for a previously inflexible work system. GM negotiated this innovative collective bargaining agreement specifically with UAW Local 652, which represented about 6,600 workers at multiple GM facilities in Lansing, Michigan at the time of the research. In the meantime, the national UAW collective bargaining agreement remained unchanged, a significant factor since there were aspects of the national agreement that were to affect LGRA later on (i.e., plant-to-plant transfer rights), although this was not recognized at the time (Richard Block, personal communication, 2008).

Along with standard contract language, the GM-UAW Local 652 contract is unique in the sense that the plant's production system is described in the contract (Block and Berg 2009). Including both hourly workers' responsibilities and salaried personnel duties in the contract reflects a more "balanced" (and egalitarian) approach to the specification of work roles. Further, in agreeing on the GMS philosophy as part of the contractual process, both management and union agreed on the elimination of waste and job role flexibility. The latter was especially important, as traditional contracts stipulate workers' job roles in greater detail, with work processes more rigid, while the Local 652 agreement broadens job roles to permit flexible work assignments in a team-based work environment.

LGRA was populated through a contractually-based volunteer transfer process based on seniority. UAW Local 652 members were given the opportunity to experience GMS through a simulated assembly line and decide whether LGRA was right for them. Fifteen hundred people volunteered to move from Lansing Car Assembly (the existing plant) to LGRA, and ultimately 661 carefully selected individuals participated in the LGRA launch. An additional 908 union-represented volunteers joined LGRA after the start of production when a second shift was added. Between November 2002 and November 2004, LGRA's workforce was comprised almost entirely of volunteers. At the start of 2004, when we began the fieldwork portion of our study, 2,087 employees staffed LGRA; 212 were salaried and 1,875 were hourly (production workers and skilled trades).

Contextual Factors: Places and Institutions

Lansing, an automotive city, was largely rural or rurally oriented until the early decades of the 20th century. Historical research shows substantial back-and-forth movement between early automotive facilities in the city of Lansing and its rural surround (Chinoy 1992; Fine 2004). Chinoy (1992) notes that early Oldsmobile workers were from farming backgrounds and had an interest in preserving a "farming way of life." Yet by the late 1940s, most small farmers had to supplement their farm income with industrial labor, increasing the influx of farmers into the Lansing factories.

When transitioning from the farm to factory, employees entered a particular type of manufacturing environment that bore some resemblances to Toyota in the years before and after WWII. Both were based in rural areas, isolated from other employment opportunities, employed farmers, and displayed elements of welfare capitalist policies with respect to employees (Cusumano 1985; Toyota Motor Company 1988).

Olds Motor Works, the predecessor to Oldsmobile, was founded in 1897 by Ransom Eli Olds, a strong proponent of welfare capitalism—an approach aimed at securing loyalty and preempting unionization by delivering benefits to workers (Fine 2003). Company-sponsored sports teams, dances, banquets, and clubs helped foster bonds across ranks and express to workers that management "cared about its employees."

Similar practices of welfare capitalism were displayed in Lansing's Oldsmobile factories (Earley and Walkinshaw's 1997). Recreation programs endeavored to establish informal bonds across the management and worker ranks, encouraging mutual respect and communication on the shop floor. Salaried and union-represented workers, often coming from the same communities, also socialized outside of work, and it was not unusual for production workers to move up the ranks and become plant management. These practices resemble those of Japanese manufacturing firms, resulting in shared values (created through social networks) that encourage individuals to trust and help one another, similar to relationships considered "social capital" (Bourdieu 1972; Putnam 2000).

High levels of social capital between union and management contributed to a “family feeling” in the workplace (Fine 2003) and pride in making quality Oldsmobile products (Earley and Walkinshaw 1997). Significantly, the original (pre-1984) Oldsmobile was an all-in-one car company, with product design, engineering, and manufacturing located in Lansing, not Detroit, adding to the sense of members’ teamwork and accomplishment.

From these contextual factors emerged a labor-management regime that displayed greater harmony than the typical GM establishment. For example, UAW Local 625 maintained a single slate of officers for more than 25 years, reflecting stability in union-management relationships, and Lansing experienced fewer grievances and strikes than other GM-Michigan cities. Data on “crisis situations” at GM from 1979 to 2000 reveal that while situations defined as disputes often resulted in strikes at units located in Pontiac, Saginaw, and Detroit, disputes *never* resulted in a strike in Lansing (Block and Belman 2003). Contextually-based cooperation between workers and managers meant that Lansing was “pre-adapted” to the GMS regimen.

Emergent Research Design

Our initial access to LGRA was gained in 2003 through an invitation extended by a research team from the School of Labor and Industrial Relations (SLIR) at Michigan State University. The team was planning to write a book documenting the emergence of LGRA, relating its early economic performance (perceived as “successful” based on quality and productivity) to the unique contractual agreement between GM and the UAW. The new plant could potentially illustrate one dimension of the lean manufacturing argument: retaining high paying manufacturing jobs in a cooperative labor-management work environment while reducing costs and improving the product quality. General Motors granted access to the plant based on this thesis. Our SLIR colleagues believed that an organizational/institutional anthropology perspective could be valuable in understanding the sociocultural factors that may have influenced the emergence of LGRA’s distinctive labor relations practices and manufacturing environment.

We proposed an exploratory, inductive case study aimed at the discovery of contextual factors that could influence the plant’s economic performance. During the exploratory phase, we uncovered two “Participant Propositions” (i.e., a proposed relationship among constructs defined or conceptualized by the research participants) (Briody and Baba 1991) regarding potential contextual factors related to work practices and performance. During that process, we recognized situational biases related to our point of access and research role that limited our ability to access alternative propositions regarding the plant’s perceived success. In the sections that follow, we retrace our methods and the conclusions drawn from them in stage sequence, pointing out where our biases limited insight and how our vision gradually resolved through increasing interaction with our field site and research participants.

Stage One: Exploratory Research Mediated through Human Resources

Exploratory research in 2004 consisted of 58 semi-structured interviews with salaried and hourly workers, direct observation in the plant, participant observation during 32 hours of GMS training, and the analysis of 170 oral history interviews with Oldsmobile retirees from Lansing plants. Our interviews were designed to uncover participants’ perspectives regarding contextual factors contributing to the plant’s early performance results. Some individuals were specifically targeted for interviews; others were solicited by requesting a demographic cross-section of the LGRA workforce from our UAW and GM liaisons. Our liaisons shared with potential interviewees the intent of our team to examine factors that may have contributed to the plant’s initial “success.” Interviewees were between the ages of 24 and 57 years and ranged from plant manager to first level supervisor on the salaried side and production workers and skilled trades on the hourly side. The sample was purposefully weighted to include women’s voices (25% of hourly and 50% of salaried interviewees were women versus 25% and 20% in the overall plant population). Reflecting the “whiteness” of Lansing’s workforce, which has long drawn on the surrounding rural areas and small towns, the sample was not ethnically diverse. We recognized that the contacts we were given by our HR and UAW liaisons could bias the early stages of our study, but we listened nonetheless for the possibility of insights into the plant’s early performance patterns.

Content analysis of interview data revealed six strong themes (i.e., appearing 70-95% of the interviews) regarding the plant’s economic performance. There were three types of themes: (1) declarative, (2) relational, and (3) predictive. Declarative themes describe dimensions of the workforce and/or manufacturing environment from the participants’ point of view, thereby constituting a participant-based description of factors internal to the organization that contribute to a successful lean manufacturing environment. Declarative themes included (1) “Lansing-GM History,” which describes Lansing’s workforce as having a long history of commitment to a quality product, pride in hard work, and loyalty to the company (93% of interviews contained such content); (2) “volunteers,” which links the productivity of the plant to the original volunteers’ willingness to do the kind of work required by a lean plant (78% of interviews); and (3) “GMS,” which describes aspects of the GMS philosophy, sanctioning these as “good” or agreeable (70% of interviews).

Relational themes connect the plant to something *beyond* the manufacturing environment; there are two. “Rural Sociality” proposes that the strong work ethic of the plant is connected to workers’ residence in rural areas, small town communities, or farms (74% of the interviews were coded for this theme). Interviewees suggested that rural lifeways taught workers “good” work behavior. Key descriptive words associated with this theme included obedience, discipline, flexibility, patience, and dedication to hard work and long hours. The following excerpts are illustrative:

People from smaller communities...we just have a different outlook on life...we do our jobs and we're more patient, more disciplined on how to get there. I want to say we're more disciplined in our culture. It's because the way we were raised. I had a lot of morals instilled in me growing up. I learned really quick in life that there's rules and you have to follow rules, and there are always repercussions if you don't...."(Ted,¹ a 49-year-old UAW committeeman)

... [On the farm] there's a lot closer-knit family relationships ...you depend on everybody; everybody in the family has a role. When you grow up on a farm with a bunch of kids, they all chip in, they all work. I think they're more disciplined, I think they come to work. And I think absenteeism is not an issue...maybe it's the work ethic I guess that gets instilled in them at a young age. The cows have to be milked every morning. You can't take a day off in milking cows because they'll blow up. (40-year-old skilled tradesman)

These comments suggested that LGRA might have been benefiting from distinctive socialization or enculturation processes.

The second relational theme, "Social Networks," suggests that social networks linking families and communities to people in the plant account for strong support and loyalty to the plant. Working at a plant with others who have been socialized in the same manner re-enforces and enforces expected normative behavior. We labeled this phenomenon "family policing," or the monitoring and enforcement of behavioral norms by members of a kin-based group, substituting or complementing management oversight. Such behavior assumes active social networks among families, communities, and the plant (Warner and Low 1946). Eighty-nine percent of interviews were coded for this theme; the following excerpts provide examples of "family policing":

If your father went to work every day, you more or less did too, and if you didn't, he jumped on you maybe more than your boss ever did.... (Former Labor Relations Supervisor / Oldsmobile retiree)

My dad had a discussion with us, telling us that he was putting his name out there for us, and we better not embarrass him. A lot of times, if I was on another shift, we'd change shifts, and my dad would come down and see me and ask if I was working the weekend. And I can remember [that] I always thought you had to work the weekend, because he always did. I worked 64 straight days. (45-year-old male spare part coordinator, skilled tradesman)

The town I'm from [has] a very high percentage [of people who] work in the automotive industry...and I think that's an issue too because I, myself, feel a lot of pressure living in that environment, knowing—I guess you have a loyalty—you know all your neighbors and family members rely on the business that is sustained over the years. Versus if I move to California and work at a plant for two years knowing that I'm leaving. The commitment, the loyalty, is not there. [Moving for work] is more personal interest versus I know I'm living there forever.... (41-year-old male Body Shop Shift Leader)

The combination of these relational themes formed Participant Proposition #1: that "rural" workers exhibit positive work behaviors consistent with GMS principles.

There was only one predictive theme: "transfers," which appeared in 74 percent of our interviews even though we did not ask a question directly related to the theme. "Transfers" comprised a predictive hypothesis; meaning that participants were describing what was *going to happen* in the future of their plant. Participants suggested that new workers and managers transferring into LGRA would "pollute" the distinctive nature of the work environment, permitting speed-ups in production that ultimately would diminish quality, contradicting the GMS philosophy. Our interviewees were warning of a contractually-based "bumping" process that began at the end of 2004 and lasted for nearly a full year as higher seniority Local 652 members who did not initially volunteer to work at LGRA began to "level in" (participant term). In late 2004, when area plants represented by UAW Local 652 closed due to economic pressures, those LGRA workers who held the least amount of seniority at LGRA were forced onto layoff or into the jobs bank (i.e., last in, first out),² as higher seniority individuals from other plants took their places.

Some interviewees called transfers from other plants "the Flintstones." Flint is the Michigan city featured in Michael Moore's well-known documentary *Roger and Me*, known for its militant unions that refused to compromise with GM management during the 1990s. Following that period, a number of Flint area plants were closed (Block and Belman 2003). The label "Flintstones" was applied generically, to workers from Flint and to workers from other automotive cities, all of whom were characterized as not sharing the same values and work ethic as original LGRA volunteers. During our 2004 interviews, we heard statements such as the following:

And so, like everybody who comes here to Lansing, they got names like [says sneeringly] the Flintstones with their attitude and you know, people from Kalamazoo and Grand Rapids.... (40-year-old female UAW Liaison Office Advisor, former Team Member)

I think that in other areas it sounded like they had lots of free time. Where here it's never been like that...here, you're busy. You don't have free time. And that's why we always talk to people—actually when the Flint people come over here, we call them "Flintstones," that's what we call them, and that's what we tell them: "That's why you guys shut down. You didn't do a good enough job. You had too much free time. You didn't know how to work. You didn't have pride in your work. (46-year-old male Team Leader in General Assembly)

One person, one supervisor that doesn't embrace the whole concept of [LGRA work practices] can really pollute the minds of everybody that works with him. (37-year-old male Lead Technical Support)

Ralph, a 53-year-old millwright who participated in LGRA's launch, entered into an exchange with one of the authors in which he contrasted "the first people" (i.e., the original volunteers) with the newly transferred workers:

[LGRA] is changing a little even right now because we're getting more and more people from other plants. But the first people that were here, we were all a tight group. Everybody was for the common good of LGRA.

Q: And what is that?

To build cars. The best quality car in the world.

Q: You're contrasting to other people that are coming in. They don't have that goal?

I think that the amount of enthusiasm, the amount of—what would be the word? Not trust but loyalty—would be the word—I can see a difference from the floor. We have people now from Delaware, from Georgia, people all over. And some of the loyalty is not there like it used to be, when we first started out. . . . and people bring their attitudes. People bring their philosophies with them. And it's hard to change philosophies in people that have got 20-some years in.

Q: What types of philosophies are coming in from outside?

Just get the job done. Not worry about what the quality is at the end of the line, just get the job and ship it out, that's one thing. The company owes me, I don't owe the company. I think that was one of the biggest things. The people that first started wanted to be here, they believed in the program, and they felt that they were very fortunate to be coming here. And I think that's changed.

Ralph was concerned that the transfers were bringing in “philosophies” that contradicted the original volunteer group’s mission: working “for the common good” and producing quality vehicles because the workforce was “loyal” to these ideas. His comments represent the thrust of Participant Proposition #2: that transfers will “pollute” (or change) the LGRA work environment and possibly lead to a decline in plant performance.

Once the six themes had emerged from our data analysis, we began to conceptualize relationships among them. Thinking of the six distributed themes as a local knowledge base emerging from a manufacturing community of practice (Lave and Wenger 1991; Orr 1990), we postulated a set of relationships with an emphasis upon contextual factors influencing the plant’s performance:

- Selected employees’ work ethic/practices and other performance-enhancing characteristics, their desire to be in a lean manufacturing environment, and their agreement with GMS as a “good” philosophy (i.e., declarative theme).

Is related to or derived from:

- Residence and/or socialization in a rural area, small town, or farm which instills particular norms and values, or these values are sustained by social networks that connect people in the plant to families and communities beyond the plant (i.e., propositional theme).

(The sum of the two above propositions produced Participant Proposition #1.)

However,

- The entire configuration is at risk due to the impending transfer of “other” people who do not share the same values and practices regarding the “right” way to work (i.e., predictive theme or Participant Proposition #2).

While eight of the 30 interviews contained all six themes, no single interviewee articulated the above syllogism as a concise argument. Rather, it was our own construction emerging from data analysis.

In our next stage of research, it would have been reasonable to investigate each of the three points noted above, giving equal weight to all since they all emerged from the thematic content of participant statements. It also would have been reasonable to hedge somewhat, given that our sample was known to be skewed toward a particular demographic profile (i.e., middle-age, white, employees). Yet, because of our research partnership role and the overall project orientation (or shall we say slant?) toward understanding the “successful” economic performance of a lean manufacturing plant, as well as General Motors’ location decision, we privileged the first two points noted above and held in abeyance further exploration of the third point regarding the risk of “other” people transferring into the plant. We had become convinced that General Motors’ management and at least some of the workforce believed that the relatively rural location of Lansing was a significant factor contributing to the plants’ performance, and we had become interested in further exploration of this subject (i.e., to test the null hypothesis, so to speak).

Stage Two: Rural Locations and Performance

During our second wave of data collection, we designed a short mail survey (32 questions) to assess the claim that “rural workers are better workers.” We administered the survey to all LGRA union-represented employees ($n=1685$), and gathered data about employee place of residence, place of socialization, family relationships to Lansing plants, and team membership. We received a 27 percent return rate ($n=454$). To cross-check self-reporting about place and to code the current place of residence for all hourly employees, we applied 2,000 United States Census Bureau categories for dividing geographic space into three categories: urban area, urban cluster, or rural. Another source of data for current residence for the entire hourly population was that shared by the LGRA HR department (void of identifying material to protect worker confidentiality).

We found that over half of LGRA’s total workforce (both union-represented and salaried workers) currently live in counties where farming contributes to more than 50 percent of the county’s economic base. Fifty-seven percent of survey respondents self-reported being raised in rural or small town Michigan communities (45% according to 2000 United States Census categorization), and 22 percent reported being raised on farms. In interviews, we learned that while some workers themselves did not grow up on farms, they might have worked on farms owned by other families.

Our mail survey data also showed that the majority of respondents (61%) were second, third, fourth, or fifth generation Lansing-GM workers. Moreover, the majority (65%) of respondents gained employment at GM through network ties and three-quarters of these were with family members.

This finding provides support for the portion of Participant Proposition #1 regarding generations of family members working within the plant.

Are Rural Workers Better Suited For Lean Manufacturing?

With a sense that there was a relatively substantial rural representation within LGRA's workforce, significant numbers of which were intergenerational referees, we explored statistical associations between these two variables and individual performance. We explored differences for employees hired through referrals (as opposed to open hires), for workers who transferred from out of state (as opposed to individuals who spent their lives in Michigan), for individuals with long daily commutes (which might affect attendance), and for rural vs. urban geography.

To assess individual performance, we collected attendance data from HR. Attendance is essential in lean production systems because they rely on full participation of all employees. Unlike traditional plants, "lean" facilities do not build in "floaters" (i.e., personnel to fill in for absent employees). Therefore, whenever a team member needs a bathroom break, requires help with a problem on the line, or is otherwise offline, the team leader must work on the line, prohibiting the team leader from fulfilling his/her normal duties. If the team leader is online, there are no other hourly workers ("floaters") to step in for their co-workers to help with breaks or repairs. Help must come from the group leader, who is a salaried employee in charge of all teams within a work group (groups usually consist of 3-6 teams). If two members of a team are absent, then hourly team members, team leaders, and group leaders from other areas of the plant temporarily replace those absent. Thus, as few as two unplanned absences could have a significant impact upon productivity and the overall work environment.

HR records attendance in two categories: (1) "contractual" absenteeism, or absences permitted within the GM-UAW collective agreement (e.g., bereavement, vacation) and (2) "controllable" absenteeism, or unplanned absences *not* permitted within the UAW-GM labor agreement. Perfect attendance lists also are developed on an annual basis, reporting on individuals who never miss a day of work all year (i.e., neither contractual nor controllable absenteeism). While controllable absenteeism figures are logged in a database as employees "clock in," the HR department does not retrieve reports from the system on a regular basis. We, therefore, relied on perfect attendance lists (which HR tracks regularly) in our statistical analyses.

Findings from one-way ANOVA tests (Table 1) demonstrated that workers from rural areas had significantly better attendance patterns than workers from urban areas, and workers referred through personal recommendations have significantly better attendance than those who were hired through open-hires (both significant at the .025 confidence level). By contrast, individuals who transferred to LGRA from out-of-state ("OUT OF MI") have poorer attendance habits than workers who transferred from other places in Michigan

Table 1. Effects on 2002-2004 Perfect Attendance

Covariates	Coefficient	Std. Error	t	Sig.
AGE	.005	.003	2.156	.032
FEMALE	.012	.050	.238	.812
MINORITY	-.116	.064	-1.799	.073
FAMMEM	-.002	.006	-.238	.812
GNR8ON	.002	.026	.094	.925
REFERRED	.097	.043	2.252	.025
DISTANCE	.000	.001	.125	.901
MARRIED	.037	.045	.817	.415
FARM	.020	.046	.446	.656
LAND	-.069	.045	-1.535	.126
OUTOFMI	-.213	.104	-2.051	.041
HRLYRATE	.022	.011	1.974	.049
URBAN	.000	.096	.005	.996
RURAL	.126	.056	2.255	.025
KIDSNO	-.009	.016	-.609	.543
PREPROD	.811	.065	12.517	.000
URBAN	.000	.096	.005	.996
RURAL	.126	.056	2.255	.025
PREURBAN	-.131	.147	-.892	.373

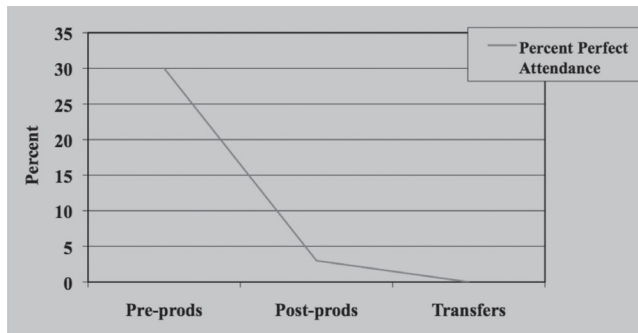
a. Dependent Variable: PERAT3YR

(significant at the .041 confidence level). Further, the length of commute ("DISTANCE") did not have a significant impact on worker attendance. That referred workers have better attendance could suggest the influence of social networks affecting work behavior. All findings support the proposed link between "ruralness," social networks, and performance, as measured by attendance.

Stage Three: The Transfer Phenomenon

Because lean manufacturing environments are team-based, we were interested in examining whether team performance was influenced by overall geographic composition of teams (i.e., how "rural" or "urban" team members' communities of residence were on average). Asking HR for assistance in matching individuals to teams, we discovered that such matching was not possible because team composition was unstable. Between November 2004 and the summer of 2005, 115 transfers occurred, completely disrupting team composition. The 115 transfers (who were coming from traditional rather than lean plants) were just the start of the disruption, followed by a "domino effect" of individual and team job changes within the plant. As HR personnel explained, for every one transfer into the plant, two to three more internal transfers took place, because union-represented workers have the right to move to any open "preferred job," based on seniority. The idea behind this policy is that in order to run an

Figure 1. Perfect Attendance by Cohort



effective plant, people need to be in jobs that they are happy with (however, the policy was established prior to the era of work teams). When one person transfers into a team, others may transfer out, creating the “domino effect.” As a result of this transfer process, LGRA, a plant with approximately 1,500 hourly jobs total, experienced 500 to 700 job changes between the end of 2004 and the close of 2005, with nearly continuous team composition change in the interim.

Learning about the transfer process uncovered important discoveries about our initial skewed sample. We had been concerned that when interviewees said “rural” workers were better performers, and “urban or other” transfers would lead to a drop in performance, they were actually coding for the racial differentiation of the workforce (although the interviewees never said this directly). What we discovered from HR was that volunteer status, *not race*, was the key variable of concern with respect to our skewed sample. Our sample had been significantly skewed toward individuals representing the first wave of workers entering the plant: all but one individual had participated in the plant’s launch. Although we did not realize it at the time, these were the interviewees that produced the two Participant Propositions emerging from the first phase of our fieldwork. This pre-production launch workforce, which included both union-represented employees and members of management, had been committed to the original concept of the lean plant, and our two Participant Propositions appeared to represent their “folk theory” of the plant’s performance.

This revelation suggested that there was something more to the plant’s quality outcomes than the rural base of its employees. According to the literature (Babson 1995), “success” in lean manufacturing should have something to do with the relationship between the employees and their commitment to the participatory concept of the plant, which in turn could be differentiated (in this case) by the date at which a particular set of employees began working at LGRA. In other words, employees involved in the plant’s launch may display a different level of commitment to the plant than employees who joined later because of plant closures. It was at this point that we realized that the second Participant Proposition—transfers

Table 2. 2005 Attendance Comparisons by Cohort

Attendance	Preproduction	Production
2002 Imperfect Attendance	1% (n=2)	77% (n=218)
2002 Perfect Attendance	99% (n=168)	23% (n=64)
2003 Imperfect Attendance	1% (n=1)	40% (n=113)
2003 Perfect Attendance	99% (n=169)	60% (n=169)
2004 Imperfect Attendance	0% (n=0)	9% (n=26)
2004 Perfect Attendance	100% (n=170)	91% (n=256)
2005 Imperfect Attendance	30% (n=51)	35% (n=98)
2005 Perfect Attendance	70% (n=119)	65% (n=184)

from “other” plants will “pollute” the work environment—was quite significant to our research questions, pointing toward individuals who were not original volunteers.

With employee start dates and attendance data, we analyzed the relationship between performance for each cohort and time of entry into the plant. Figure 1 (reporting on year-to-date perfect attendance for January-August 2005) shows the dramatic dip in attendance levels between the preproduction group and transfers. Preproduction volunteers (i.e., the 661 original volunteers) had the highest percentage (30%) of perfect attendance for year-to-date 2005 attendance. The postproduction volunteers (i.e., the 908 who transferred in after the start of production) had a perfect attendance record of only three percent, and none of the transfers had perfect attendance. These findings suggested that preproduction workers were significantly more dedicated to GMS.

The results of the one-way ANOVA analysis (Table 1) confirm these descriptive statistics, showing a significant difference between preproduction workers and postproduction workers, which included transfers. Preproduction workers had significantly better attendance than postproduction workers (significant at a .000 confidence level). This finding suggests the launch group performed better compared to the transfer population.

However, over time, the preproduction workers’ attendance also began to drop as well, perhaps influenced by the transfer group. Table 2 compares differences between preproduction and postproduction workers’ 2005 year-to-date (January-August) perfect attendance. This data reveals that by August 2005, 30 percent of preproduction workers ($n=51$) had already missed days not permitted within their UAW contract, and were appearing on the “bad attendance” data list (i.e., the controllable absenteeism list) to the same degree as postproduction workers (30% versus 35%). By this time, the transfer phenomenon already had been going on for several months; internal turbulence generated by hundreds of team member changes may have eroded original team members’ commitment to the lean plant concept. It is possible that if a particular group of workers (e.g., transfers) did not agree with the lean plant philosophy, and their arrival interrupted

established work practices through cascading team member changes, these ideological and structural imbalances could disrupt the entire lean regimen.

Independent external data regarding the plant's performance as a whole provided another source of evidence supporting Participant Proposition #2: plant performance would decline. By the end of 2005, LGRA had dropped off the J.D. Power and Associate's top three list for initial high quality for the first time since the plant began full scale production, moving from the number two slot to 12th place (Figure 2). This drop in quality was predicted by LGRA workers in the 2004 interviews and reinforced in the 2005 mail survey. Yet in terms of productivity (efficiency), as measured in the least amount of manpower hours per vehicle, LGRA became North America's 2005 benchmark plant. Like other lean plants, LGRA had become efficient, but perhaps more "mean" in their leanness: greater efficiency meant working harder (faster, smarter?) to produce more vehicles per unit of labor power, but vehicles whose quality might not measure up to the original employees' standards.³

Discussion

Participatory Breakdown in American Lean Plants

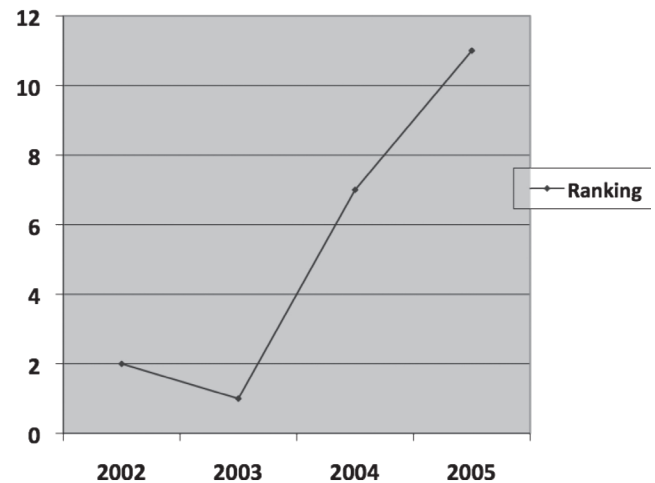
Elsewhere, Baba (2008) has evaluated lean manufacturing by raising the question: why is lean so mean? She identified four areas of breakdown in the principle of participatory management with lean manufacturing in American-owned plants. Two are particularly relevant to this case study.

First, when a lean plant is running at full capacity, there is little or no time for on-line technical problem solving (Rinehart, Huxley, and Robertson 1997). American plants typically operate under the mass production principle of *pushing* as much product through the plant as quickly as possible to achieve economies of scale (Liker, Fruin, and Adler 1999). The result is heightened physical fatigue and mental stress among workers. Focusing on increasing product output also suggests a lack of commitment to the quality components of lean manufacturing.

Second, once a plant reaches a certain level of leanness, workers become reluctant to provide any further suggestions to make the plant even leaner. As workers repeatedly perceive contradictory signals from managers in a so-called participatory program (i.e., talking about quality but not following through in practice), management loses its credibility, and workers shut down their participation in anything other than physical compliance (Vallas 2006b).

The presence of organizational or institutional processes beyond the control of the plant may also contribute to a breakdown in worker participation. Other scholars have documented how the influx of people from "other subcultures" caused by managerial career rotation, plant closures, and union "bumping" rights erodes the original personnel selection criteria, introducing managers and workers who do not match the initial selection criteria (Rothstein et al. 2006;

Figure 2. J.D. Powers Rankings, North American Luxury Divisions



Vallas 2006b). Our study affirms that such processes may break down participatory structures or people's commitment to the new regime.

Kasmir (2005) reports on a similar breakdown in Saturn. The Saturn experience shares many similarities with LGRA, including an original core of union-represented individuals and management who believed in the corporate slogan that Saturn was truly a "different kind of company," where the workforce represents empowered risk takers, and whose initial success subsided due to corporate decisions possibly linked to declines in sales and quality.

Drawing upon Gramscian and Foucauldian notions of hegemonic discipline and, in particular, Gramsci's (1971) work on corporate welfarism under Fordism, which showed how workers were disciplined both by force (e.g., union-busting and repressive labor laws) and consent (e.g., corporate paternalism, family wages), Kasmir (2005:79) argues that in the case of Saturn, workers are disciplined by a corporate hegemonic discourse that celebrates the worker as "actor" rather than machine. Saturn workers' (and LGRA workers') bodies are "made" into productive and efficient beings by GM corporate discourse appropriating the values of the "American work ethic" and incorporating them into a Japanese-style lean manufacturing business model.

In Rhody and Tang's (1995) comparison of Japanese and American automotive workers, Japanese workers are characterized as having a stronger work ethic, emerging as a result of Confucianism, which teaches "family values," harmony with one's environment, and conflict resolution (Saha 1990). Deriving from a Protestant Work Ethic, the American Work Ethic, in contrast, emphasizes individualism, asceticism, and industriousness. These religious roots may produce differences in workforce behavior, with Japanese workers and management expressing some mutual confidence because there is

a general trust that management would be less likely to exert detrimental, arbitrary, or capricious actions on the workforce (Rhody and Tang 1995; Saha 1990). While incorporating elements of Japanese production systems, GMS provides a focus on the individual as a team member; each individual is seen as a key player in the production process—machines are replaced by decision makers, a key distinction from the Saturn experience that Kasmir (2005) describes. Yet, as Liker, Fruin, and Adler (1999); Rothstein, Huber, and Gaskell (2006); and Vallas (2006b) have demonstrated, transferring lean manufacturing into American contexts is questionable as the principle of participatory management is vulnerable to breakdown when American-owned plants meet a certain level of leanness and management begins to prioritize productivity over worker participation and product quality.

At LGRA, the original workforce gave up certain rights (e.g., the protection of work rules) because they believed in GMS—they agreed upon a particular way of conceptualizing and enacting labor relationships and work processes because they believed these to be legitimate forms of work practice in a modern manufacturing plant. Yet, major changes in the global economy, including the rise in oil prices and intensifying competition from the East, seem to have led the corporation to be most attentive to producing cars at the lowest possible cost. What organizational decision makers may not have recognized is how institutional structures tethered to older Fordist regimes, such as national collective bargaining agreements, and global forces beyond the organization's control (e.g., economic shocks) interact in unexpected ways to disrupt carefully laid plans for “flexibility” and prevent local operations from contributing to global production systems as planned.

GM's vision for LGRA depended upon a production philosophy grounded in the social mores, relationships, and practices of a particular form of human community, but not one that is grown organically from the setting. Although we believed at first that we had discovered an “organic” labor relations system pre-adapted to the GMS platform (i.e., the labor relations tradition of Local 652), our ethnographic journey revealed that, in practice, LGRA was more or less “utopian” in having been planned top-down by management to fulfill the vision of an ideal social order created for purposes of global productivity and quality. In the early days of the LGRA experiment, when GM appeared to have “control” over the membership of the plant—meaning the selection of both production workers and managers—the utopian vision unfolded as planned; performance results for quality and productivity were exceptional. Yet, as witnessed, there is no guarantee that “management” or any other mechanism of social engineering will be able to maintain control over the contexts in which human communities are embedded. Ironically, the very institution created decades ago to protect workers from managerial excess (i.e., the GM-UAW national contract) played a role in unraveling management's carefully planned “utopia.” Some of those production workers (the pre-production group) who were in favor of the ideal form of social community also

appear to have been defeated, as their attendance patterns deteriorated by a possible “contagion” effect. Conditions at the plant had been so intricately constructed that only a small proportion of transfer employees ($n=115$) interacting with union work rules reduced quality results.⁴

Lessons Learned

Global companies, by definition, attempt to create models that can be replicated in any pocket of the world. GMS is GM's model, and it is being implemented around the globe in all of their facilities. In this paper, we have examined some of the contextual factors that influenced the distinctive labor relations and manufacturing environment in central Michigan's automotive industry. How might GM apply what has been learned from the GMS experience in Lansing, Michigan to its implementation in other parts of the world?

This study suggests that GM has invested a great deal of its human, capital, and material resources in designing innovative engineering systems for producing quality vehicles. As an institution, however, GM does not appear to have made an equally strong investment in understanding how societal, organizational, and human systems intermesh dynamically over time. At one level, the company does not appear to be highly context-sensitive or self-reflexive with respect to others' views of it as an institution. A recent case in point was the run-up to its bankruptcy, when GM sent corporate executives to Washington in private planes to plead for federal bail-out funds, provoking Congressional fury. Such disconnection from, or disregard for, the mainstream host society could reflect the company's history as a confederation of quasi-autonomous car divisions that were more or less independent of one another, and even competed with one another, without jeopardy, so long as each met its return on investment (ROI) objectives. Through various reorganizations beginning in the 1980s, GM has tried to amend this historical legacy, with questionable success. One result of such an institutional culture might be the formation of innovations or experimental models that are similarly insular or do not acknowledge systems connectivity in a holistic sense with all of the complex ramifications that might affect a factory, including not only those that impact productivity, but others that affect quality (e.g., human and cultural factors). In the future, as GMS is deployed in more varied locales around the world, GM should consider dynamic systems modeling (Agar 2004) as a means to test the potential outcomes of various configurations of technical and social factors, including those that are not under the control of the management. A stronger role of social, behavioral, and economic sciences in constructing and interpreting these models could support GM in this effort.

GM also should consider the transformation of the world's economy toward services and the meaning of the service economy for GMS and its people. Service employees create value for customers by “co-constructing” with them intangibles that meet customers' wants and needs. Quality may be viewed as such an intangible; it is not a “hard” variable,

but shifts its meaning according one's perspective. LGRA began by providing workers with the training and support to build quality into each vehicle—workers had the time to think about how to make the process and the product better for the customers. But, as time went on, this regime eroded and regressed toward getting the cars out the door as efficiently as possible. In other words, LGRA back-shifted from a service-oriented organization to a manufacturing-oriented organization. Such a back-shift also may result from GM's particular brand of "car company," which places a premium on car design and development and de-privileges manufacturing (Baba 1995). This same pattern may have manifested itself in the LGRA launch, as it did in Saturn. A substantial amount of enthusiasm surrounded the "newness" of the innovative plant design and work practices at LGRA, but once the plant was up and running, it became just another manufacturing facility, and workforce creativity and empowerment were no longer fostered, contributing to a decline in product quality. GM should beware of an imbalance between "launch experiences" and everyday operations in its GMS facilities, expecting the "big bangs" to carry the day. A manufacturing plant is not the same as a car model; it cannot be designed once and then it replicates itself endlessly. Like any human community, GMS requires constant attention or it will run down. This is especially true in the service economy, where people are creating value for other people and relationships are critical. If workers sense that they are in a standard manufacturing plant, it is likely that they will behave accordingly.

In sum, by signaling that the plant is a "machine," governed by technology and oriented toward efficiency rather than an intricate inter-connection of services that people provide to each other, GM will set the conditions whereby GMS inevitably fails. For GM to be successful in today's new service economy, the corporation must build and support structures that enable the workforce to co-create the value associated with quality. GM will not be able to obtain the extra "service" contribution from its workers, that is, the *sine qua non* in today's market (the new service economy) with an outmoded emphasis on design and development and the de-privileging of manufacturing. Doing so would require a different management model, one in which people and culture are taken more seriously, as contributors to the bottom line. Some Asian automakers understand this equation, which is one reason they have been able to surpass GM (Baba 2008).

Notes

¹Pseudonyms are used throughout the paper.

²The jobs bank program guarantees pay and benefits for union members whose jobs fall victim to technological progress or plant restructurings. Workers typically end up in the jobs bank only after they have exhausted government unemployment benefits, but in some cases they move directly into the program. Benefits last until employees are eligible to retire or return to the factory floor (Hoffman 2005).

³By 2007, Cadillac had fallen to the 25th place (of 35 nameplates), registering an average of 133 problems per 100 vehicles, well below

the industry average (125 problems per 100 vehicles). Yet in 2008, LGRA ranked first in the Midsize-Premium Conventional Segment in the Harbour Report.

⁴Transfers of managers also may have played a role, yet local managers often are responding to economic conditions and messages from their chain of command. Another theory for the drop in attendance by the launch group could be explained by the Hawthorne Effect (i.e., that worker performance is altered by observation) (Mayo 1949). If the original group were aware of the innovative nature of the production system being launched and had a stake in its observed success, this may explain their early commitment and waning productivity. Additionally, over the course of our study, build complexity heightened as LGRA went from producing one Cadillac model to three. Moreover, the Cadillac market was in high demand, resulting in months of prolonged overtime (six days a week with every third Saturday off), contributing to worker fatigue, which also may have been a factor in absenteeism (Mike Reinert, personal communication, May 2009).

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