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Continuous Improvement and Changes to Work Organisation and Training in the Australian Automotive Parts Industry

Richard Gough
Bob Park

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Richard Gough and Bob Park
Victoria University & University of South Australia

Abstract

This paper examines the experience of two similar but contrasting firms in the Australian automotive parts industry in their attempts to adopt continuous improvement during the 1990's. The firms are similar in having devolved responsibility for quality checking to employees, having adopted standardised operating procedures, and having had good management union relations under the metal industry award. They differ in that one is an assembly operation while the other is a manufacturer, the first has a mainly female workforce and the other a mainly male workforce, and the first has moved further in flattening management structures and decentralising decision making. The impact of these changes on employees, particularly their skill levels and work stress, is explored, with a focus on the tensions between employees' improvement initiatives and management's standard operating procedures. The impacts of negotiated vocational training schemes and competency-based classifications are explored in light of the similarities and differences between the firms.

Introduction

This paper examines the experience of two similar but contrasting companies in the Australian automotive parts industry in their attempts to adopt continuous improvement during the 1990s. The two companies are referred to as AssemblyCo and ManufacturingCo throughout this paper and are part of larger sample of 17 Australian automotive parts companies, which are being bench marked against similar companies in the UK, USA and Japan.

Continuous improvement in the automotive industry has derived from the manufacturing system at Toyota, popularised by Womack, Jones & Roos (1991) as lean production. An important part of continuous improvement has been to devolve responsibility for quality checking to shop floor employees and to set up standard operating procedures for each workstation. Involvement of employees in problem solving and process improvement also forms part of the aims of continuous improvement.

The attraction of continuous improvement in the Australian automotive parts industry has stemmed from the need for reductions in cost and quality improvement. This is due to the high level of international competition in the industry, which is subject to oversupply and competition from newly industrialised countries in Asia (Department of Industry, Science

and Resources 1999). Part of these competitive pressures is the requirement by the car assemblers in Australia (and also overseas) that their major suppliers provide cost reductions of 2 -3 per cent each year.

The first section of the paper presents an overview of the issues. The paper then establishes the similarities and differences between the two companies in order to help explain the somewhat different outcomes with regard to continuous improvement in each case. This is followed by a discussion of delegation of quality control to shop floor employees and standardisation of jobs. In the discussion of job standardisation the tension between employees' ability to initiate improvement and standard operating procedures controlled by quality managers is assessed. The next section looks at the extent to which employees in each company have been empowered to make changes as the result of attempts to introduce continuous improvement. This is followed by a discussion of whether the stress levels of employees' jobs have been increased. Finally, the interaction at each workplace between the adoption of continuous improvement and the development during the 1990s of vocational training for shop floor workers and job classifications based on competencies is discussed.

Overview of the Issues

International research on lean production and continuous improvement in the automobile assembly and components sectors reveal that, although some of the major elements of lean production have been transferred from Japan, it has been applied less intensively and transformed in various ways outside Japan (Adler 1999b). Specifically, the literature on the application of lean production concepts to Japanese automotive assembly operations in North America and UK shows widespread adoption of standard operating procedures and worker involvement in quality checking. Off line involvement, however, in continuous improvement activities occurred at lower levels in these workplaces compared to Japanese plants (Stewart, 1992; Graham,1993; Rinehart, Huxley & Robertson, 1997; Mishina, 1998;Garrahan &; Adler,1999). Research by Lowe, Delbridge & Oliver, (1997) on the world automotive components sector also indicates a much lower level of employees involved in non Japanese automotive component plants compared to Japanese component manufacturers. However, where such involvement exists, there is much greater involvement of workers as distinct from team leaders in non-Japanese automobile component workplaces (Delbridge, Lowe & Oliver 2000).

A recurrent finding in the literature on automotive assembly operations in Japanese transplants was the existence of repetition strain injuries amongst workers (Garrahan & Stewart, 1992; Graham,1993; Rinehart, Huxley & Robertson, 1997; Babson, 1998). This problem is traced to the production pressure caused by Just-in-Time production control systems combined with the resultant intensification of repetitive work. Some research on this issue indicates that it is less of a problem in Japan compared to North America (Wokutch, 1992 and Adler 1999b). Union led responses to these problems in North America has led to some amelioration of workloads responsible (Babson, 1998 and Adler 1999b).

In the context of employee involvement in problem solving training would seem to be required to achieve optimal outcomes. In Australia the development of formal training for process workers has been developed with the support of employers and unions during the 1990s (Gough 2002). Buchanan (2000), however, argues that the use of teams and TQM techniques, based on lean production, has led to more productive use of labour through employees becoming multi-tasked and that the training that has occurred has been largely directed to this end and also to improved team functioning and leadership. Thus, he concludes that the training has been more behavioural than technical as intended by the metal industry model.

Methodology

Each workplace was given a comprehensive survey to be filled out by the relevant manager about all facets of its operations including productivity and quality, human resources and customer and supplier relationships. In both workplaces seven team leaders and a senior shop steward were interviewed. Also interviewed were the HR manager, the training manager, senior manufacturing engineer, plant manger and quality manager. The interviews lasted up to 90 minutes and covered issues similar to those in the main survey to validate the survey findings.

Basic Characteristics of AssemblyCo and ManufacturingCo

In some respects the experiences of the two companies in adopting continuous improvement are similar, but in important ways they differ. Given both companies faced a similar competitive and industrial relations environment, it is important to see how their similarities and differences help to explain their experience of continuous improvement. In this section these similarities and differences are explored.

AssemblyCo produces an important safety item for automobiles. Besides access to world class technology it also has research and development facilities on site, which are used throughout the group. It has a dominant position in its market in Australia and has won best supplier awards from the automobile assemblers. It has recently gained export contracts in Asia and has expanded its workforce from just over 300 to 541 in the last two years. Prior to its takeover by a European multinational in the late 1980s it was an Australian company with a very poor industrial relations record. It now has a very good industrial relations climate and offers above industry average employment conditions and wages. The workplace is covered by the metal industry award. As a result its job classification structure is based on the competency standards developed by the metal industry employers and unions during the 1990s. The training developed for shop floor employees, the Engineering Production Certificate (EPC) (subsequently changed and renamed Metal and Engineering Industry Training Package), has been used in the workplace.

ManufacturingCo is also noted for the innovative nature of its products and the strength of its research and development (R&D). It has operations in Asia and North America and also exports from its Australian plant which has 1100 employees. Its

products are also important safety items in an automobile. In the late 1990s it has rapidly expanded its export production both in Australia and in North America. It has very cooperative relations between unions and management. Similar to AssemblyCo it is covered by the Metals Award and its new training arrangements. Both workplaces have largely migrant workforces with a large number of migrants from South East Asia. Since the middle 1990s ManufacturingCo has been testing job applicants to ensure they have reasonable levels of language and numeracy skills. The Migrant English classes have been phased out due to lack of any further applicants. Employees that have been tested predominate in the afternoon and evening shifts, but form only a small proportion of the day shift. Comment from the Human Resources and Training (HR) manager indicates that the newer employees are more likely to show the initiative needed in a continuous improvement environment. At AssemblyCo language classes are available one day a week and team leaders find they can communicate effectively in English on shopfloor issues. New employees are hired as casuals through a manpower agency and are only made permanent after at least a year. Where the companies differ is that a European multi- national, which has operations in over 40 countries, owns AssemblyCo. It is a pure assembly operation with no manufacturing activities. Assembly operations have become more automated in recent years. ManufacturingCo is an Australian owned company and is characterised by highly automated foundry and machining operations with relatively automated final assembly. Over the last four years ManufacturingCo has made major investments in German high-speed computer controlled machining centers and automated foundry operations. In machining, employees are now running up to five machines, whereas until recently they were responsible for only one. These changes have led to redundancies often halving the size of work groups. The number of employees in final assembly lines has been reduced from 7 or 8 to 2 or 3 with the introduction of more automation. Another important difference is the gender profile. All the shopfloor workers at AssemblyCo are female. In ManufacturingCo a majority of the workers are male, although there are some females in final assembly. The organisational structure at AssemblyCo is flat with team leaders reporting to two production managers who report to the manufacturing manager who is responsible to the managing director. The structure at ManufacturingCo is more complex with team leaders or leading hands reporting to supervisors who then report to area managers. Area managers are responsible to a manufacturing manager who reports to the plant manager and then the managing director. It is apparent from the above discussion that the two companies operate in a similar competitive and labour environment, but have significant differences. In particular the installation of more highly automated production technology has been a critical improvement focus of ManufacturingCo, whereas AssemblyCo has focussed more on improving process operations.

Quality Control and Job Standardisation

One of the major changes that has occurred in both companies since the early 1990s has been the introduction of on-line quality checking and the documentation of work processes. The documentation of work processes or development of standard operating procedures is controlled by quality engineers, who make them part of the process control documentation necessary for quality accreditation.

At ManufacturingCo in the early 1990s quality inspectors checked quality once a day. Now operators use gauges to check quality every two hours and record the results on charts. As a result scrap rates have reduced markedly as problems with process and parts have become apparent much more quickly. The higher levels of automation have also affected quality and output. In the middle 1990s the training manager undertook a documentation of all jobs in the plant to determine the correct method of operation. This process, which took two and a half years, provided the basis for standard operating procedures (SOP's) for every workstation. At AssemblyCo similar quality checking had been introduced by the middle 1990s. As one of the team leaders commented:

> *Before we would just make a belt and hope it was right sort of thing.*

The standard operating procedures were developed by industrial engineers in discussion with team leaders and operators. The existence of standard operating procedures and their control by quality engineers raises important questions about the extent that employees can be involved in continuous improvement. If employees are unable to change work methods, then a major source of involvement is denied them. Any suggestions for change have to go through the team leader to production managers and then to quality engineers. Where there is more than one shift other shifts have to be consulted. In order to achieve conformance to quality standards there is a need for operators to follow the same steps. Discussion with the team leaders and managers revealed that changes to operating procedures were rare, occurring only a few times a year. However, there would seem to be some flexibility within the SOP's. They tend to set critical steps in a process and standards that have to be met by an operator checking or by gauging. One of the team leaders at AssemblyCo commented:

> *Our SOP's are a guideline within our quality standards, so we do not differ from those, but within the guidelines if we can alter the way we do something to achieve the same result, we do.*

Thus, minor changes to improve the process by operators would seem possible within the constraints of the SOP's.

Extent of Employee Empowerment with Continuous Improvement

In response to the main survey ManufacturingCo answered that responsibility for quality improvement was 25 per cent for operators, 25 per cent for team leaders and 50 per cent for quality specialists. AssemblyCo indicated that the responsibility for quality improvement rested 20 per cent with operators, 20 per cent with team leaders and 60 per cent with indirect staff such as industrial engineers, quality specialists and skilled trades. Discussion with the team leaders from ManufacturingCo showed that a 25 per cent level of operators' involvement in quality improvement was an optimistic estimate. The complexity of the automated machinery makes it difficult for operators to come up with solutions even though they have identified problems. One of the team leaders in the machining area indicated:

> *They don't have the answers, they are definitely aware of the problems they are encountering.*

Production teams in ManufacturingCo also do not operate as quality circles. When problems arise, cross-functional teams of engineers, quality staff, and team leaders meet together. Longer-term projects do involve a couple of operators. Further, in ManufacturingCo industrial engineers establish standard times for jobs when new machinery is brought in. According to one of the shop stewards, who is also a team

leader, operators think out ways to do the job faster, but do not necessarily pass the information on. Managers and team leaders also commented that for some employees there was a conflict between improving productivity and the resulting loss of overtime.

At AssemblyCo the managers interviewed indicated that, although the production teams did not operate formally as quality circles as in Toyota, the regular morning team meetings provided an opportunity for operators to raise issues and suggestions. According to the team leaders when defects occurred team leaders, industrial engineers, maintenance staff and quality specialists were involved with operators in identifying the problem and finding a solution. Overall it would seems that the process of driving continuous improvement down to the shop floor and empowering employees in this respect has a fair way to go, particularly at ManufacturingCo.

Work Stress

One of the major problems identified by researchers with lean production has been increasing work pressure and injury (Babson, 1995 and Rinehart, Huxley & Robertson, 1997). Of the two companies AssemblyCo has most obviously adopted Toyota production ideas. It has a fully-fledged Just-in-Time system and a system of one piece working, where operators only produce one unit and pass it on to the next operator. Previously operators had produced batches of a product, which were stacked between them. Discussion with the team leaders revealed that there had been an improvement in health and safety due
to a number of factors. The introduction of automation in various parts of the process had got rid of work that caused injuries. Multi-skilling of most operators so that they could rotate through all the jobs on their product lines also reduced injuries (employees worked in teams dedicated to a particular automobile manufacturer, which were spread over several lines for different parts of the product). One of the team leaders commenting on the changes said:

> *The machinery has made it easier…We know the whole line now, whereas before it 'that's my job'. That* [job rotation] *saves injury too.*

One of the experienced team leaders who acts as an adviser in the setting of new lines argued that having stock piled up around them was stressful for operators since they felt pressured to hurry up. One piece operation was less stressful and allowed operators to get into a work rhythm. She said that the one-piece flow had also led to a proper balancing of workloads so those bottlenecks did not result from employees being overloaded. Such line balancing was done in discussion with the operators. Operators, as occurs in the Toyota approach, could be removed from lines depending upon the level of demand. Those left on the line would cover more operations. Generally the team leaders considered that the times set by the industrial engineers were not stressful. One noted anecdote regarding slower employees:

> *The new people are not fast enough, or some people are just slow and you try to help them. There are not many people like that…on our cell we have an old lady who is a bit slow, but everyone understands.*

The shop steward, however, disagreed. She argued that, on lines where employees were removed after rebalancing, employees were stressed due to handling more machines or processes. She also claimed that operators were not opening up about their concerns.

However, one important measure of worker discontent, labour turnover, has fallen from 13.1% in 1994 to 0.5% in 1999. Resolution of this important point requires further interviews with operators to clarify the issue. It is clear, however, that a lot of the changes have been beneficial for employees.

At ManufacturingCo, despite the existence of SOP's and operator responsibility for quality checking, other aspects of the Toyota system are not as apparent as at AssemblyCo. This, in part, is related to the predominance of manufacturing operations as distinct from assembly in the production process. Further, 38 per cent of the actual final assembly operation is automated compared to 26 per cent in AssemblyCo. Another feature of the Toyota system not fully developed at ManufacturingCo is the existence of teams. Attempts to choose and train team leaders during the middle 1990s at the plant were not followed through. The reason given by management and team leaders was resistance by the then area managers to losing responsibilities to supervisors, who were in turn supposed to pass on some of their duties to the team leaders. Recent redeployment of the area managers and the appointment of younger university trained engineers is seen by the HR managers as alleviating this problem. Another reason for the lack of follow through was the major expansion of production overseas and the distraction of management attention and redirection of resources away from developing teams. Industrial engineers were involved in setting targets for each line. However, discussion with one of the team leaders, who was also a shop steward, indicated that the target was not difficult to achieve and some employees would stop for a while, when they reached their hourly target. This is currently a matter of discussion between the shop stewards and management. Such a situation does not point to a situation of undue work pressure. Hence, it would seem that the form of work organisation that has developed in both workplaces does not seem to have generated the sort of problems found in North American automobile manufacturers, who have adopted lean production.

Training

In the 1990s the training reforms resulted nationally in the development of flexible modularised training encapsulated in industry training packages and assessed through competency standards. In the metal industry the Metal Trades Federation of Unions (MTFU) and the Metal Trades Industry Association (MTIA) developed these competency standards over a number of years. These competencies and related skills became the basis for classifying jobs. This led to disagreement between the MTFU and the MTIA over the level of competencies needed for particular jobs, since higher competencies meant higher levels of pay. For training of non-trades employees in the metal industry the Engineering Production Certificate (EPC) was developed.

At AssemblyCo, before employees can currently be promoted to team leader, they have to complete the EPC. Discussion with the team leaders revealed that those who had done it early on found that modules such as welding and sheet metal were not relevant to them. The course and provider was subsequently changed to include more on communication and supervision. The training manager suggested that the EPC provided a good basic training that improved understanding, but that those who undertook the course might not

explicitly recognize this. Both the training manager and the HR manager explained that they could not afford to put more than 16 employees through at any one time and so it was restricted to team leaders and potential team leaders. A separate form of vocational training, the Train the Trainer course, was highly valued by team leaders, who had to train employees on the job. It was also seen as providing valuable skills in managing groups. Basic training had also been provided to all employees in 1997 on AssemblyCo's version of the Toyota Production System covering issues like line balancing. The HR manager considered, because it was directly relevant to employees' daily work, that they had remembered it. Use has been made of the competency standards to assess jobs and employees to identify skill gaps.

At ManufacturingCo the major changes in technology have led to a polarisation of skills. Almost all production employees were now classified at C13, at the bottom of the job classification structure. Employees such as machine setters who had been classified at C11 were no longer required. All tooling is now computerised and could be simply placed in the machines and removed by an operator. There were almost no trade employees at the C10 level. They had been replaced by fitters with post trade qualifications at the C8 level and electronic technicians at the C6 level.

About 150 employees had started the EPC, but less than 30 had completed it. The HR manager did not see it to be of great relevance. He, however, argued that the competency standards had been of value. They had helped in assessing skill gaps and training employees in specific jobs as well as being used for job reclassifications. The team leaders, however, indicated that it was difficult to get employees reclassified to the C12 level because of management's denial that the jobs required such skill levels. A couple argued that the extra skills could enable employees to save the company a lot more than the pay differential between the two classifications.

During the late 1990's basic training had been provided to employees in problem solving. However, more recent employees had not received such training. Some of the team leaders had also not received any training for their role.

Conclusion

In these two case studies it is apparent the attempt to empower employees as part of continuous improvement has not gone very far, especially in the case of ManufacturingCo. The focus on technological change, the diversion of resources and management attention to export development and the failure to develop teams have retarded such empowerment with ManufacturingCo. Developments in both companies to date also do not seem to have placed employees under undue stress as might have been expected with the application of ideas derived largely from lean production, particularly in the case of AssemblyCo. In this respect, that the companies are European and Australian in ownership rather than Japanese might be a factor. However, the explanation can also be traced to the characteristics of the two companies explored in the paper.

The failure to complement the push for employee empowerment with the

training available through the EPC would also seem to be explicable in terms of the characteristics of both companies, particularly in ManufacturingCo, where a lack of belief in the usefulness of the EPC and a concern to limit the level of competencies of employees for cost reasons was apparent.

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