A Resource-based View Perspective on Lean Production: A Case Study

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ABSTRACT

The Resource Based View and Lean Production focus upon value, efficiency and waste. The RBV sees firms with superior systems and structures being profitable because they have lower costs, higher quality and superior products. Lean implementation reduces cost, whilst improving quality and delivery performance, which increases customer value.

A case study at SteelCo explains the implementation of Lean in terms of a resource based perspective. SteelCo’s knowledge of pipe making was combined with external knowledge of Lean Production. The team-based problem solving approach improved processes, shaped culture and helped develop a learning organisation. When a Lean philosophy had become embedded within the organisation, a process of continuous improvement generated new resources and capabilities. The Lean implementation increased productivity by 50%.

Keywords: Lean, resource-based view, capability, sustainable competitive advantage
INTRODUCTION

North East England has historically had a greater dependence on manufacturing than many other regions of the country. However, globalisation and the economic downturn have threatened the North East’s manufacturing core (One North East 2006). In response, One North East, the Regional Development Agency (RDA), funded the North East Productivity Alliance (NEPA) to help regional manufacturing companies improve their competitiveness through the application of Lean tools and techniques. SteelCo was the largest company involved in the initiative and received the most extensive support, which improved the competitiveness of the company.

According to the resource-based view (RBV), a firm can develop and sustain competitive advantage by ensuring appropriate access to and control of a bundle of idiosyncratic resources which are valuable, rare, inimitable, non-substitutable and durable (Barney 1991; Penrose 1959; Wernerfelt 1984).

The paper presents a framework based upon the resource-based approach, which analyses the competitive position of the company, evaluates resources and capabilities and then utilises an iterative process for developing new resources and capabilities. The case study at SteelCo illustrates how the Company was able to improve its competitiveness by building new Lean capabilities and resource configurations.

THE RESOURCE BASED VIEW

The Resource Based View (RBV) considers that the external perspective of strategy is insufficient to fully explain the sources of competitive advantage. Some resources may belong to the firm, whereas others, such as consultants may be accessed on a temporary basis (Mills, Platts & Bourne 2003a). Resources are the tangible and intangible resources that a company controls, possesses or has access to in combination with the human resources of the firm (e.g. skills, knowledge and motivation) which create organisational capabilities (Grant 1991). Barney (1991) argued that resources which are heterogeneously distributed...
across firms and are imperfectly mobile can be a source of sustainable competitive advantage. The resource-based approach sees firms with superior systems and structures being profitable because they have lower costs, higher quality or superior product performance (Teece, Pisano & Shuen 1997). The RBV is concerned with efficiency and the elimination of waste (Peteraf & Barney 2003). An enterprise has competitive advantage if it is able to create more economic value that a competitor operating at breakeven. The economic value is the perceived value gained by purchasers minus the economic cost. It has two components: the consumer surplus or delivered value, which is the perceived benefits minus the price; and the producer surplus, or residual value, which is the price minus the economic cost (Peteraf & Barney 2003). The residual value is equal to the economic rents attributable to the more efficient factors within the firm. Economic rent is the return to a factor in excess of its opportunity costs (Peteraf & Barney 2003). The resource-based perspective focuses upon strategies for exploiting firm specific assets to maximise economic value (Teece, et al. 1997).

Grant (1991, p. 119) defined a capability as ‘the capacity for a team of resources to perform some task or activity’. Teece et al. (1997) suggested that capabilities occur ‘(w)hen firm-specific assets are assembled in integrated clusters spanning individuals and groups so that they enable distinctive activities to be performed’. Organisational capability is a ‘firm’s capacity to deploy resources for a desired end result’. Resources and capabilities are sources of sustainable competitive advantages if they are valuable, rare amongst a firm’s current and potential competition, imperfectly imitable, non-substitutable and durable (Barney 1991).

A dynamic capability is ‘the ability of an organization to purposefully create, extend, or modify its resource base’ (Helfat, Finklestein, Mitchell, Peteraf, Singh, Teece & Winter 2007, p.4). Dynamic capabilities contribute to competitive advantage through enhancing resource configurations, or by building new resource configurations. Competitive advantage does not derive from the dynamic capability itself because its functionality can be copied by other firms in the industry (Eisenhardt & Martin 2000).
However, dynamic capabilities help a firm respond to environmental changes by opening new strategic paths (Helfat 1997). Eisenhardt and Martin (2000) argued that dynamic capabilities consist of ‘identifiable and specific routines’. Some dynamic capabilities integrate resources, such as product development routines where managers combine various skills and function to develop products and services. Other dynamic capabilities include knowledge creation routines where managers create new thinking in the firm. The evolution of dynamic capabilities occurs along a unique path that is specific to the firm. However, they are shaped by well known learning mechanisms, for example repeated practice and crises.

Teece et al. (1997) considered competences and capabilities to be embedded in organisational processes, with competitive advantage being derived from distinctive processes shaped by the firm’s asset position and its evolutionary path. Organisational processes include routines, current practice and learning which are used for coordination/integration, learning and transformation. ‘Assets’ include technology, intellectual property, customer base and external relationships. The value of individual learning depends upon their application in the particular organisational setting. Learning is social and collective and arises from joint contributions to understanding complex problems (Teece, et al. 1997).

LEAN PRODUCTION

The Toyota Production System (TPS) was developed in Japan by and forms the basis of Lean Production. Toyota focused upon minimising waste in all aspects of its operations (Spear & Bowen 1999). The aim was to create value for internal and external customers. It provides an approach based upon continuous improvement that seeks to minimises waste, which increases manufacturing performance and competitiveness (Katayama & Bennett 1996). Womack (2002) specified five Lean principles: 1) specify the value desired by the customer; 2) identify the value stream for each product or service providing that value and challenge all of the wasted steps; 3) make the product or service flow continuously; 4) introduce pull between all steps where continuous flow is impossible; and 5) manage toward perfection so that the
number of steps and the amount of time and information needed to serve the customer continually falls. Lean Production requires distinctive shop floor processes, practices and managerial processes (Teece, et al. 1997). It is difficult to replicate because ‘it requires systemic changes throughout the organisation and also among interorganizational linkages, which might be very hard to effectuate. Put differently partial imitation or replication of a successful model may yield zero benefits’ (Teece, et al. 1997).

Herron and Braiden (2006) developed a three stage maturity model that described the application of Lean Production techniques. The first stage is Gemba Kanri (Workshop Management), which stabilises the manufacturing system so that it is reliable and controlled. In stage 2 just-in-time principles are applied to maximise productivity. In the final stage the focus is upon continuous improvement. The Lean tools and techniques implemented by NEPA were based around a ‘Common Approach Toolkit’ that included: i) the building blocks – 5C/5S, seven wastes, visual management, standardised operations and continuous improvement; ii) supporting tools – data analysis, problem solving, set-up improvement (or single minute exchange of dies (SMED)), line balance, process mapping, production-led maintenance (PLM), work measurement, poka-yoke, failure mode and effect analysis (FMEA), value stream mapping (VSM) and 7 New tools (Herron & Hicks 2008). Lewis (2000) found that every organisation follows its own unique Lean implementation trajectory which is imperfectly imitable, therefore leading to sustainable competitive advantage (Lewis 2000).

**RESEARCH MODEL**

The literature provides various classifications of resources (see for example, Hofer & Schendel 1978; Mills, et al. 2003a). Mills et al. (2003a) classified resources into six categories: tangible resources; knowledge, skills and experience; system and procedural resources; cultural resources and values; network resources; and resources with potential dynamic capability.

[insert Figure 1 here]
Figure 1 presents a model based upon the Mills et al. (2003a) classification. Competitive pressures are due to: the bargaining power of customers, the bargaining power of suppliers, rivalry within the industry, new entrants and product substitutes (Porter 1980). The RBV views competitive advantage in terms of the economic value. This can be increased by reducing costs and/or increasing perceived value to customers, for example by increasing quality or reducing lead-times. The price determines the distribution of value between the customer and the supplier. The next steps are to classify resources and capabilities and identify strengths and weaknesses relative to competitors taking into account rent generating potential (Grant 1991). Alternative approaches to developing resources and capabilities are then considered. There are a number of strategic choices, for example engaging in strategic alliances, developing new products or improving processes using Lean Production. The next step is to acquire Lean expertise, which can be achieved through appointing staff with appropriate expertise and experience or by securing the services of a consultant. This provides the platform for generating resources and capabilities through implementing Lean.

Mills et al. (2003b) used a triangle to represents a capability arising from how the company has configured and deployed its collection of resources, which are positioned within the triangle. The arrows on the triangular boundary indicate the coordination of resources. This approach is used to illustrate the iterative process of developing Lean resources and capabilities through continuous improvement, which continuously reignites learning (Winter 2000).

**CASE STUDY**

In 2008, a case study was conducted at SteelCo, a subsidiary of a multinational company based in the North East of England with 305 employees on site. The company produces steel pipes for supplying the oil and gas industry globally. The company was selected for this research for three reasons. Firstly, it was the largest implementation of Lean assisted by NEPA. Secondly, it represents one of the top five high
value-added manufacturing sectors in the North East region, i.e. basic metals and fabricated metal products (SIC code: DJ) (ONS 2009). Finally, the company had implemented Lean for over four years at the time of conducting the case study, which allows retrospective study of the sustainability of Lean.

Data collection

The sources of evidence consisted of documentation, semi-structured interviews and observation. The documentation included key performance sheets between 2000 and 2008, brochures on products and processes, a booklet on strategy deployment, Company and other websites. The interviewees were sampled from all organisational levels, i.e. a General Manager, a Continuous Improvement (CI) Manager, a Process Manager, a Works Engineer, two Team Leaders and four team members (shop floor workers). Each interview lasted approximately one hour. The list of questions was sent to the respondents one week in advance to allow the respondents to prepare answers. Questions were assigned to different respondents to suit their responsibilities, knowledge and experience in the company and Lean implementation. Each set of questions was answered by at least two respondents to enable data triangulation. Direct observation was scheduled immediately after the interviews in order to observe the manufacturing process and Lean implementation on the shop floor as well as verifying the accuracy of the information collected from the interviews. Data was triangulated leading to a greater confidence in the validity of the data. NVivo version 7 was used for coding data in accordance with the categories derived from the research model.

Application of resources and capabilities model

This section applies the framework in Figure 1 to the case. SteelCo faces fierce competitive pressure from integrated global competitors, it has relatively small scale and there are new entrants from low cost economies. Suppliers from Malaysia have potential competitive advantage in terms of cost, but are not yet able to produce high specification pipes to the same quality as SteelCo. Although the market is price sensitive, this capability is highly valued by customers that use the pipes for safety critical applications in
the oil and gas industries. SteelCo’s Group does not produce steel plate, which is the main raw material and the barriers to entry are prohibitive. Building a plate mill was therefore not a strategic option. SteelCo has long term contracts to purchase plate from its competitors, but has little control over price due to the suppliers’ dominant position. Its producer surplus is therefore being squeezed by both customers and suppliers. An evaluation of resources and capabilities identified the need to improve customer intimacy (Tracy & Wiersema 1993) reduce costs, improve productivity, quality and delivery.

SteelCo decided to embark on Lean production to improve its competitive position, through reducing costs and increasing perceived customer value. It chose to work with NEPA because it had considerable expertise in Lean, the training of the workforce was funded by the Learning and Skills Council and the Regional Development Agency and it provided ongoing support. This decision to follow a Lean path provided the strategic direction to address to the competitive pressures.

SteelCo implemented 11 Lean tools and techniques in the following sequence: 1) 5C/5S –the bedrock of Lean implementation that increased safety and production speed; 2) problem solving focusing one waste elimination; 3) visual management; 4) standard operations; 5) kaizen; 6) process mapping; 7) single minute exchange of dies; 8) production-led maintenance (PLM); 9) value stream mapping; 10) motion economy; and finally 11) policy deployment. The NEPA training was based upon Master Classes (Bateman & David 2002; Herron & Hicks 2008) that provided a forum for social and collective learning, which combined with the Company’s knowledge of precision pipe manufacturing with NEPA’s knowledge of Lean. This path allowed SteelCo to develop inimitable resources and capabilities.

[insert Figure 2 here]
deployment because they had to set individual objectives to suit annual business objectives. Team leaders also used process mapping, SMED and motion economy. Managers implemented Lean at the strategic level using value stream mapping and policy deployment.

Leadership is a central element when developing dynamic capabilities and a culture of learning (Rosenbloom 2000). At SteelCo senior managers overcame resistance from the workforce and middle managers by providing a supportive environment and adopting a policy of openness. This included empowering employees, setting clear and realistic targets, and effectively communicating future plans and results.

One of the most important **tangible resources** was a series of press machines which were capable of producing high specification pipes. The implementation of Production Led Maintenance prevented these machines from breaking down and therefore, increased the availability of the machines which increased productivity. A **network for sharing knowledge** between NEPA Company staff contributed to the development of a learning organisation (Senge 1990). Team-based problem solving helped eliminate waste, reduced process times, improved quality and provided a forum for learning. Over time the **organisational culture** was shaped, through the encouragement of continuous learning, empowerment, worker participation, openness and focusing on product quality and customer service. A constructive challenge culture was facilitated through the application of visual management, Kaizen and Policy Deployment. The wide use of colour codes to visualise the updated status of production performance (e.g. quality performance and work-in-progress quantity) made it easy for management and workforce to see the status of production. The number of Kaizen suggestions per week was displayed in each of the sections. The effective operation of the Kaizen system was important for continuous improvement and the sustainability of Lean. The Senior Manager instigated **systems, procedures and routines** to support the Lean implementation. 5C/5S was the first Lean tool implemented and was used by all staff on a daily
basis. It improved the physical organisation of the workplace, reduced waste and improved visibility. Embedding 5S/5C built up the confidence of the workforce. The Lean implementation made workers’ operations safer, more standardised and easier. Safe working conditions contributed to an increase in production speed. Fewer accidents reduced lost time, which led to more pipes being produced per shift. Backlogs were cleared more quickly; pipes were dispatched to customers in shorter delivery lead times; and finally, the company could accept more orders.

[Insert Table 1]

Table 1 shows two key metrics used to measure the impact of Lean in the company: productivity and delays due to changeover activities, the wait for work-in-progress (production delays), and machine breakdowns (mechanical and electrical delays). From 2004 to 2006 productivity increased slightly. In 2007, there was an increase in productivity of 25% due to both the capital investment and Lean implementation. Overall delays dropped by 28.6% whereas changeover, production, and mechanical and electrical delays dropped by 23%, 26% and 42%. This helped increase turnover from £55m in 2004 to £173 million in 2007, which supported further investment in resources and capabilities that helped make Lean successful and sustainable.

Policy deployment based on the Japanese Hoshin Kanri was used to engage all employees in the business planning process (Lee & Dale 1998). It focused upon increasing productivity, reducing costs and improving quality and delivery performance. Progress against objectives was monitored, partly through the use of visual management. Targets, such as the number of suggestions per week were regularly increased as part of a strategy that aimed to stretch the organisation to achieve continuous improvement (Hamel & Prahalad 1993).
The Company developed a *dynamic capability* in Lean based upon its specific organisational context and developed resources and capabilities that were rare, non-substitutable and imperfectly imitable in terms of its path dependency. It was able to do this by building a new resource configuration by combining its knowledge of precision pipe manufacturing with NEPA’s knowledge of Lean. Learning was reinforced through repeated practice, empowerment and team work.

**CONCLUSIONS**

The Resource Based View and Lean Production both focus upon customer value, efficiency and waste (Peteraf & Barney 2003; Womack 2002). The RBV sees firms with superior systems and structures being profitable because they have lower costs, higher quality and superior products (Teece, et al. 1997). The implementation of Lean helps reduces economic cost, whilst improving quality, responsiveness and delivery performance, which increases the perceived benefits. Thus additional economic value is created, which is then shared between customers and the suppliers in accordance with the price. Lean can therefore make companies more competitive because at a given price they can achieve a larger producer surplus than their non-Lean competitors. Their products are also more attractive to customers because they offer a larger customer surplus.

The framework developed in the paper explains how SteelCo assessed its competitive pressures, its resources and capabilities. The Company selected a strategy of Lean implementation due to the availability of support from the North East Productivity Alliance. SteelCo’s knowledge of precision steel making was combined with NEPA’s knowledge of Lean Production. The team based problem solving approach improved processes, shaped culture and contributed to the development of a learning organisation. One of the biggest successes arising from Lean implementation in the company was an increase in productivity (measured in terms of the number of pipes pressed per shift) of 50% over the first five years of Lean implementation. The senior manager estimated that around 15% of the improved
productivity came from capital investment in tangible resources, i.e. the replacement of aged and bottleneck equipment, which improved the availability of machines and cycle times. The other 35% came from the development of intangible and organisational resources and capabilities through the Lean implementation. The resources included well-maintained machines, knowledge, skills and experience, a structure for developing the workforce’s knowledge, a network system of sharing knowledge and a positive attitude and a challenge culture. The unique history and organisational contexts of the company, the specific routine of implementing Lean tools and techniques, strong leadership of the senior manager and unceasing effort of the workforce made the developed resources and capability valuable, rare, imperfectly imitable, non-substitutable and durable.

The Company became increasingly competitive. It produced products faster and more productively, achieved better quality and had fewer non-value adding activities. This led to improved customer value in terms of cost, quality and delivery which in turn helped the company gain more orders, rapidly increasing its turnover and increase profits.

**REFERENCES**


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Figure 1: RBV Model of Lean Implementation

Figure 2: Lean tools and techniques
Table 1: Productivity and delays (2001 – 2008)

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008(^2)</th>
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<tbody>
<tr>
<td>Productivity (pipes pressed per shift)(^2)</td>
<td>n/a</td>
<td>n/a</td>
<td>100</td>
<td>111</td>
<td>114</td>
<td>116</td>
<td>145</td>
<td>150</td>
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<tr>
<td>Overall delays (%)</td>
<td>29.10</td>
<td>29.60</td>
<td>27.16</td>
<td>23.8</td>
<td>20.9</td>
<td>23.6</td>
<td>21.8</td>
<td>17.0</td>
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<tr>
<td>- Changeover (%)</td>
<td>6.68</td>
<td>5.59</td>
<td>5.06</td>
<td>6.1</td>
<td>6.7</td>
<td>8.3</td>
<td>5.8</td>
<td>4.7</td>
</tr>
<tr>
<td>- Production (%)</td>
<td>13.87</td>
<td>16.67</td>
<td>15.86</td>
<td>12.7</td>
<td>8.8</td>
<td>9.0</td>
<td>11.7</td>
<td>9.4</td>
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<tr>
<td>- Mechanical and electrical (%)</td>
<td>8.55</td>
<td>7.34</td>
<td>6.23</td>
<td>5.0</td>
<td>5.4</td>
<td>6.3</td>
<td>4.3</td>
<td>2.9</td>
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\(^1\)From January to March 2008. \(^2\)For reasons of confidentiality, the figures are based upon 2003 productivity set at the value 100.
Competitive pressures

Classify resources and capabilities

Analyze producer and consumer surplus

Evaluate resources and capabilities

Acquire Lean expertise

Lean Production

Evaluate alternative ways to develop resources and capabilities

Employ specialists

Use consultants

Continuous improvement

Tangible

Knowledge

Cultural

System and procedural

Dynamic capability

Network

Other strategies e.g. Joint ventures, relocation etc.