Institution: Newcastle University

Unit of Assessment: 19 Business and Management Studies

Title of case study: Lean management for manufacturing SMEs: Improving practice, performance and infrastructure in the North Sea Region of Europe

1. Summary of the impact

In order to address the issue of why so many small and medium enterprises (SMEs) find it difficult to put the principles of Lean production into practice, research at Newcastle developed a 'bite-size' methodology suited to their requirements. The research has had impact in three areas: on the practice of 25 SMEs involved in an international project in the North Sea Region of Europe; on the performance of these companies on such measures as cost and productivity; and, in the form of six new Innovative Productivity Centres, on the regional infrastructural support for SMEs.

2. Underpinning research

Research context

Research at Newcastle helps manufacturing and service providers improve their competitiveness through enhanced Lean/agile supply and operations strategy. Those whose work is featured here are Professor Christian Hicks (1987-), Dr Tom McGovern (1988-), Dr Adrian Small (2010-), Colin Herron (PhD student 2003-2006), and Paul Braiden (1983-).

Emerging from techniques developed in the automotive industry, many manufacturing organisations have increased their competitiveness through the adoption of Lean Production techniques. The Lean approach is focused upon minimising waste and synchronising processes to increase performance and competitiveness. It allows companies to improve quality, whilst simultaneously reducing costs and lead-times. However, existing literature demonstrates that many companies have been unable to successfully implement and sustain Lean. The way in which Lean has been implemented has neglected to take into account contextual factors such as the size of a business and the associated resource constraints.

Implementing Lean based on company needs

Research at Newcastle developed a new diagnostic tool that could be used to help direct Lean interventions. The research found that by adding a stage to the Lean process, i.e. identification of needs, the existing Lean model could be implemented more successfully **(1-3)**. The tool comprises needs analyses in the areas of productivity, manufacturing and training. This three-stage process is designed to match appropriate tools and measures with companies' manufacturing problems. This was necessary because the previous Lean consultancy approach trained participants in the techniques of Lean, but it did not allow companies to identify priorities. Businesses were therefore in a position where they understood the principles of Lean and how to implement it, but they did not necessarily know how best to target their resources at the most important productivity problems.

Revising Lean for application in SMEs

The North East Productivity Alliance (NEPA) was established by One NorthEast, the regional development agency in North East England, to improve the efficiency of SMEs in the region through applying Lean manufacturing management practices and knowledge. Hicks, McGovern and Parry-Jones undertook an evaluation of the Manufacturing Advisory Service (MAS)/NEPA framework for transferring Lean practices into firms in North East England **(4)** (Grant 1). Their research showed that while the results of this transfer were positive for some of the larger companies involved, smaller companies were unable to benefit from this approach. The researchers recognised that small firms lacked the resources and expertise to adopt Lean and that what they needed was an approach tailored to their requirements.

European Regions for Innovative Productivity (ERIP)

Building on the earlier research **(1-3)**, the Newcastle team took the lead in a large-scale project to support the transfer of Lean into SMEs from across the North Sea Region (Grant 2). The ERIP project was part of the larger EU-funded Interreg programme which advocated a transnational approach to addressing issues of productivity and efficiency in SMEs. Because Newcastle research had identified exactly how Lean manufacturing tools and techniques have been

transferred into companies, they were selected to be the lead partner in this six-country project.

The objective of the ERIP project was thus to build on the research base created at Newcastle to develop a methodology that could be used by SMEs across the North Sea Region. The Newcastle team were responsible for organising how data were collected, used and analysed within all 25 participating SMEs. The template that was produced to collect data also provided a mechanism that the SMEs adapted for their data collection activities to aid decision-making. Working on the basis of the MAS/NEPA framework, the research reinforced the conclusion that it is difficult for SMEs to find the time to undertake the necessary improvement activities. In response to this, the research developed the 'bite-size Lean' framework **(5)**. The framework comprises three phases: 1) pre-diagnostic, which is a half-day event as an initial meeting with the company to give an overview of Lean; 2) diagnostic, which determines the areas to focus on for improvement in the company; and 3) improvement workshops, which address the needs identified in phase 2.

3. References to the research

1. Herron, C. (2006). 'A methodology to disseminate selected Lean manufacturing tools into general manufacturing'. PhD Thesis. University of Newcastle upon Tyne (available on request).
2. Herron, C., Braiden, P., (2006). 'A methodology for developing sustainable quantifiable productivity improvement in manufacturing companies'. *International Journal of Production Economics*, 104(1), 143-153. DOI: http://dx.doi.org/10.1016/j.ijpe.2005.10.004 (ABS List 2010 3*).
3. Herron, C., Hicks, C. (2008). 'The transfer of selected Lean manufacturing techniques from Japanese automotive manufacturing into general manufacturing (UK) through change agents'. *Robotics and Computer-Integrated Manufacturing*, 24(4), 524-531. DOI: http://dx.doi.org/10.1016/j.rcim.2007.07.014.
4. Hicks, C., McGovern, T., Parry-Jones, C. (2007). 'Productivity Needs Analysis of companies in North East England assisted by the North East Productivity Alliance'. Newcastle: NA Consulting. (Available on request).
5. Powell, D., Hicks, C., McGovern, T., Small, A. (2013). 'A bitesize Lean change methodology for small and medium-sized enterprises'. *Lean Management Journal*, 5(3), 7-11. Available at: http://www.leanmj.com/2013/06/bite-sized-lean/ (accessed 24/09/13).

Table of Relevant Grants

	Principal Investigator(s)	Grant Title	Funder/Sponsor	Period of Grant	Value to Newcastle
1.	Chris Hicks	Evaluation of the North East Productivity Alliance	One North East	Jan-Dec 2007	£7,200
2.	Tom McGovern	European Regions for Innovative Productivity (ERIP) project	EU (Interreg)	June 2008-Dec 2011	€428,000

4. Details of the impact

The underpinning research detailed in Section 2 identified and addressed key issues and barriers associated with the implementation of Lean manufacturing for different sizes of business. The ERIP project enabled participating companies to directly benefit through: 1) improved company practice; 2) improved company performance; and 3) improved regional infrastructure.

Company practice

The competences within each North Sea country have been strengthened by executing transnational showcase events with SMEs as a more effective way for small companies to share and transfer knowledge. A total of 236 people undertook transnational training. A key difference in the design of the Newcastle bite-size Lean approach was in the diagnostic and workshop activities, which minimised the time a team and change agent would need to commit to an improvement

event. The framework additionally enabled SMEs to more easily collect quantitative and qualitative organisational data and to understand the need to do so in order to effectively measure the benefits of their operations.

Key Performance Innovations Ltd. is a micro SME that was formed to provide commercial solutions for productivity improvements within businesses where previously there had been public aid and delivered the training aspect of the ERIP project. As the Director, Key Performance Innovations Ltd. commented: *"Whilst the ERIP methodology drew on aspects of the traditional MasterClass, the … project was structured around using local examples and empowering the workforce to identify what activities the project would focus on, which provided a different emphasis…The companies that I worked with who signed up to the project received various benefits. One company displayed characteristics of a larger manufacturer and wanted primarily to engage with the training of change agents, two were looking to move into manufacturing and learnt valuable lessons about how a Lean operation would need to be configured. The final two companies were the most responsive to the programme. The main challenge these companies faced related to freeing up staff to participate in the improvement events. With a little tweaking to the format of the improvement events, taking a more bite sized approach seemed to work better…I think the most value came from the knowledge exchange and the building of a network of SMEs trying to engage with Lean"* **(IMP1)**. This was reinforced by the Production Manager, Peacocks Medical Group Ltd.: *"The development of a bite-size Lean approach was more appropriate for our organisation as it allowed us to meet our operational commitments as well as engaging with the ERIP project"* **(IMP2)**. Established in 1903, Peacocks Medical Group has been supplying medical equipment and services for over 100 years. They have over 170 direct employees and over 60 indirect employees.

Company performance

The project developed a transnational best practice Lean change methodology that is publically available via the ERIP website. As the Production Manager, Peacocks Medical Group commented: *"Knowing that the ERIP web site and access to the ERIP materials is being made available for the foreseeable future is also a benefit"* **(IMP2)**. A final conference for the ERIP project was held in Newcastle, which enabled the project partners to present their achievements and challenges. The conference was also attended by representatives from regional government, SMEs from Europe and the UK, public sector practitioners and participants from each of the 6 regional Innovative Productivity Centres. In total 52 people attended the conference, demonstrating their willingness to commit time to sharing practice with one another. The conference brought together for discussion and evaluation the experiences of the both the partners and the SMEs in implementing Lean manufacturing. The Production Manager, Peacocks Medical Group commented: *"We were able to bench mark where we were in comparison to other companies involved in the project. We were also able to…potentially build a network for any potential future collaboration with other SMEs"* **(IMP2)**. Highlights of the impacts described at the conference and by participants include the following:

- L-Druck is a printing company and the introduction of methods learned through the ERIP project reduced the lead time of a quotation process from 16 hours to 1 hour. The cost savings per year amount to more than 140,000€ **(IMP3)**. The company employees 70 people and is based in Germany.
- Based in Sweden and with 37 direct and 14 indirect employees, Falk Graphic Media is a printing and graphic producer that had long setup times due to incomplete customer orders, unclear quality levels and down-time. Through ERIP, they reduced setup times, scrap levels and down-time **(IMP4)**.
- Based in Norway and employing 50 people, Noca produces printed circuit boards and electronic products, and they improved their visual management due to the 5S activity of the ERIP project, including the use of toolboards **(IMP5)**.
- In Belgium, one participating SME demonstrated a 32% increase in value added per person (10€/hour) and a 20% increase in stock turns. Another had a 52% increase in productivity and a third participating SME had a 10% increase in internal quality in their powder coating department **(IMP6)**.

- In the UK, Peacocks Medical Group estimated that they have reduced waste through improving materials requisition by 25% and improved their floor space utilization by 15% **(IMP2)**.

Regional infrastructure

As a legacy of the ERIP project, an infrastructure has been established in the form of Innovative Productivity Centres (IPCs) **(IMP7)**. Each IPC comprises a university, an exemplar company and a regional development agency. They were created to facilitate the development and spread of Lean knowledge and the ERIP methodology. The transfer of knowledge is achieved through a combination of change agent training, staff exchanges and exemplar visits. SMEs are thus made aware of their competitive competencies, allowing them to identify their own areas for improvement. Communication between regional and national governments about Lean allows the methodology to spread and potentially make the North Sea Region more competitive. The IPCs in Holland and Belgium have already become spin-out companies **(IMP8)**.

In the case of the northern Netherlands, this initiative has been driven by NPAL, the region's foreign direct investment agency. Its Manager recognised the impact of ERIP: *"as an outcome of the ERIP project we have taken the learning forward and as a result established a Northern Productivity Alliance (similar to NEPA founded in the North East of England) called NPAL… We initially started with the four SMEs involved in the ERIP project but this has grown and we currently work with 34 companies in three Lean6Sigma clusters…NPAL organizes also improvement clusters in the field of safety, health and environment, Sustainability and HRM issues. In total over 100 companies are participating in different activities, represented by over 200 persons. In all the clusters we use insights we generated by the ERIP project."* **(IMP9)**. The Director of Key Performance Innovations Ltd. also commented, *"I felt the collaboration and knowledge transfer element was important and helped support such small organisations implement aspects of Lean. By setting up the regional hubs…the SMEs could be exposed to a regional exemplar… To complement this learning, the SMEs could draw on each other for help and advice as well."* **(IMP1)**.

5. Sources to corroborate the impact

(IMP1) Testimonial from Director, Key Performance Innovations Ltd.

(IMP2) Testimonial from Production Manager, Peacocks Medical Group Ltd.

(IMP3) Prof. Thorsten Litfin & Jens Mehmann (2011) *The German Experience.* Available at: http://ir18.ugent.be/erip/?q=node/28 (accessed 30/08/13).

(IMP4) Dr. Birgitta Öjmertz & Björn Westling (2011) *Comparisons between different SME programme philosophies.* Available at: http://ir18.ugent.be/erip/?q=node/28 (accessed 30/08/13).

(IMP5) Daryl Powell (2011) *Applying Lean Practices in SMEs: The Norwegian Experience.* Available at: http://ir18.ugent.be/erip/?q=node/28 (accessed 11/09/13).

(IMP6) Prof. Hendrik Van Landeghem & Thomas Van Landeghem (2011) *The Belgian Experience.* Available at: http://ir18.ugent.be/erip/?q=node/28 (accessed 11/09/13).

(IMP7) Innovative Productivity Centres http://ir18.ugent.be/erip/?q=node/26#h.7a56995a35c1 (accessed 11/09/13).

(IMP8) Spin-off Veltion reinforces the Flemish SMEs (01/08/13). Available at: http://www.ugent.be/en/news/bulletin/veltion.htm (accessed 01/10/13).

(IMP9) Testimonial from Manager, Noordelijke ProductiviteitsAlliantie (NPAL)