Institution: University of Liverpool

Unit of Assessment: 19 – Business and Management Studies

Title of case study: Closing the North West's Prosperity Gap – Using the Liverpool Agility Methodology to Deliver a Productivity Improvement Strategy for Manufacturing SMEs (Small and Medium-Sized Enterprises) in the North West of England

1. Summary of the impact

This case study concerns the economic, commercial and organisational benefits gained from the application of original research undertaken between 1999 and 2013 by the Operations & Supply Chain group at the University of Liverpool Management School. The research has provided significant new thinking concerning the design of agile organisations and supply chains through the creation of frameworks and tools for the development of SME-focused, resilient business strategies. Since 2008, the application of the research has supported a priority component of the *Future North West* regional productivity strategy for the North West of England through the implementation of a wide range of economy-driving and productivity-enhancing industrial applications. These applications have: boosted the region's economy and the prosperity of its citizens; facilitated the growth of the region's manufacturing SMEs; supported the participation of SMEs in global networks; equipped SME owner-managers with the knowledge and skills to facilitate business growth; improved the professional behaviour and cognitive characteristics of employees, and led directly to 117 jobs and several businesses safeguarded, and 31 new jobs created.

2. Underpinning research

Agility is now recognized as a by-word for responsiveness. It is a concept that harnesses organizational resources to respond to the uncertainty of a volatile business environment. Agility achievement provides the means to being able to align production with demand, and ultimately provide customer-driven processes and customization capabilities. In this context, agility is primarily concerned with the fast production and delivery of products to customers in response to changes in customer demand. The agility research programme has been 15 years in the making and represents an account of the lifecycle of a research theme that has been conceived, grown, and developed into the Liverpool Agility Method (LAM) (or Liverpool Agility Framework) as the means for translating the agility research into practice. LAM has been developed by the following researchers at Liverpool: Boughton (1996-2003); Ismail (1990 to date); Kehoe (1985 to 2008); Lyons (1999 to date); Michaelides (2008 to date); and Sharifi (2003 to date).

Initially part of the Engineering department at Liverpool, the Operations and Supply Chain Management group came together as part of the University of Liverpool Management School when it was founded in 2002. This fundamental research into the concept of agility began in the late 1990s and primarily concerned the analysis of manufacturing responsiveness and the development of methodological approaches to address responsiveness issues within the manufacturing domain. It led to research outputs that include some of the most highly cited agility papers in the world. For example, the seminal paper published by Sharifi and Zhang in 1999 (see reference in section 3) provided significant impetus to the agility movement in the UK by presenting a conceptual model for the emerging theory and by setting a widely respected research agenda for the development of the agility theme. In 2001, Sharifi and Zhang (reference section 3) extended their initial ideas and conceptualized and demonstrated, through the development of a structured methodological approach and its application to a series of case studies, how agile thinking can be structured and inculcated into the strategic planning processes and working practices of manufacturing policy makers and managers. Also in 2001, Kehoe and Boughton (reference section 3) demonstrated how information systems and Internet technologies could be incorporated into the agility theme. A key component of this idea concerned the role of information systems in improving transparency across supply chains and collaborative networks which led to the award of the EPSRC's £1.25m Innovative Manufacturing Research Centre. Additionally, the research was augmented and complemented by the examination of the emerging role of the Internet in the management of

industrial organisations, and the development of frameworks and methodologies for bringing together Enterprise Resource Planning, Supply Chain Management and e-Business. This culminated in an award of almost £6m for the AIMES (Advanced Internet Methods & Emergent Systems) research centre and led to the creation of several new businesses including Aimes Grid Services (an IT solutions provider) in 2005 and Containerport (an information services provider for logistics providers and shipping companies) in 2006, and to the development of the Liverpool Agility Method (LAM) and its seven steps (differentiation analysis, trend analysis, competitive positioning, target setting, agility growth options, agility planning, implementation) as the principal vehicle for translating the agility research into practice.

The need to strengthen the research through the recognition of the performance and responsiveness-enhancing impact of contemporary supply chain design led, in 2006, to Ismail and Sharifi (reference section 3) extending the supply chain focus of the LAM and introducing a practical approach for demonstrating how the supply chain design process should be aligned and integrated with the market and the product design process. In 2011, Ismail, Poolton and Sharifi (reference section 3), drawing on all of the earlier work, further extended the approach by incorporating a practical, top-down, strategic framework to assist manufacturing SMEs to enhance their resilience when operating in turbulent business environments. The approach builds on the premise that resilience occurs as a result of the implementation of both operational and strategic capabilities. The agility research has been published in over 20 journal articles, and in one book (see Lyons *et al.* in section 3) and has been supported through the award of over £10M in research and knowledge exchange funding.

3. References to the research

The impact of the research is underpinned by a body of published works which represents some of the most highly-cited "agility" papers:

- Sharifi, H. and Zhang, Z. (1999). A methodology for achieving agility in manufacturing organisations: An introduction, International Journal of Production Economics, 62 (1/2), 7-22. (ABS 3*, 2012 impact factor 2.081, paper cited by 327)
- Sharifi, H. and Zhang, Z. (2001). Agile manufacturing in practice: Application of a methodology, International Journal of Operations & Production Management, 21 (5-6), 772-794. (ABS 3*, 2012 impact factor 1.252, paper cited by 177)
- Kehoe, D.F. and Boughton, N.J. (2001). New paradigms in planning and control across manufacturing supply chains: the utilisation of Internet technologies, International Journal of Operations & Production Management, 21 (5-6), 582-593. (ABS 3*, 2012 impact factor 1.252, paper cited by 96)
- Ismail, H.S. and Sharifi, H. (2006). A balanced approach to building agile supply chains, International Journal of Physical Distribution & Logistics Management, 36 (6), 431-444. (ABS 2*, 2012 impact factor 1.826, paper cited by 67)
- Ismail, H.S., Poolton, J. and Sharifi, H. (2011). The role of agile strategic capabilities in achieving resilience in manufacturing-based small companies, International Journal of Production Research, 49 (18), 5469-5487. (ABS 3*, 2012 impact factor 1.460, paper cited by 10)

and by the publication of a recent book

- Lyons, A.C., Coronado-Mondragon, A.E., Piller, F. and Poler, R (2012), Customer-driven supply chains: from glass pipelines to open innovation networks, Springer. (1,500 chapter downloads)

(Citation and download data taken on the 13th November 2013)

Key grant awards:

- Kehoe, Lyons, Ismail, *Innovative Manufacturing Research Centre*, EPSRC £1.25m, 2001-2007.
- Kehoe, *Advanced Internet Methods & Emergent Systems*, ERDF £2.086m and NWDA £3.8m, 2003-2007.
- Ismail, Sharifi, *Developing and Implementing Agility Growth Strategies*, Objective 1 / ERDF

£1.6m, 2000-2014.
- Lyons, *Resilient Multi-Plant Networks (REMPLANET)*, EC FP7 funding €223k, 2009-2012.
- Lyons, Michaelides, Hernandez, Li, Tickle, *Collaborate to Innovate (C2i)*, ERDF £910k, 2012–2015.

4. Details of the impact

The North West Regional Development Agency identified in 2009 that regional prosperity (GDP per head) is considerably below the UK (86% of the average in 2008) and the USA (64% of the average in 2008). The principal reason for the gap is weak productivity performance where the North West level is 10% below the UK average and 25% below the USA average. Productivity is the key driver of the North West's long-term economic performance but the shifting of the regional economy towards services has been recognised as a drag on its productivity performance and widened the productivity and prosperity gap[2]. The productivity of the North West's manufacturing businesses is vital to the prosperity of the region. Supporting a priority component of the regional strategy to reduce the economic growth rate disparity between the North West and other regions of the UK and elsewhere, the ULMS team has undertaken an ambitious programme of work to apply the LAM in order to improve the productivity and resilience of the region's manufacturing SMEs. Since 2008, the widespread application of some or all of the seven steps of the LAM to the manufacturing operations and supply chain systems of over 75 SMEs throughout the North West region (approximately 10% of the region's manufacturing SMEs) and the recognition of the effectiveness of the applied research process has, regionally, supported the key growth strategy and provided significant input for policymakers. At the firm level, it has enhanced the performance and sustainability of the region's key, manufacturing SMEs, and, at the workforce level, it has improved the leadership, management and innovation competencies of owner-managers, and created 31 new jobs and safeguarded 117 at risk jobs.

- **Regional impact**: the cumulative effect of transforming the agile behaviours of the stock of firms supported has made an important contribution to economic growth. The SMEs were selected because of their high-growth potential and their presence in key, economy-driving sectors such as aerospace, automotive and precision engineering. Their contribution to the economy is far higher than their number alone would suggest. (It has been previously demonstrated by NESTA 2009 report, how relatively few businesses with high-growth potential can make a disproportionately positive contribution to the UK economy) The continued success of these SMEs is critical to the future success of the North West region. All continue to survive and prosper, with a combined annual revenue generation in excess of £1.25billion, many with improved gross value added (GVA) performance (see SME dataset referred to in section 5) and with sufficient economic weight to catalyse the catch-up of the prosperity and productivity of the region. The legacy benefit of improving the absorptive capacity for innovation and the entrepreneurial culture of these firms has provided the region with a platform of high added-value manufacturing SMEs which, in many cases, via the application of the LAM, have been future-proofed against market uncertainty and equipped with the means to respond to unexpected requests and events, new opportunities and changes to customer demand requirements. Two separate clusters of SME members of the North West Automotive Alliance are being actively supported through the development of strategic initiatives in the areas of collaborative design and collaborative procurement.

- **Business impact:** At the firm level, the growth and sustainability of the SMEs is related to LAM informed strategic change developed by the firms' owners and managers as evidenced by the changes to strategic positioning and direction that have been made at a number of the SMEs. For example, at Richardson's Healthcare, a series of projects concerning the development of an agile operations strategy, and changes to working practices and quality systems, led the MD to comment *"I didn't think that a bunch of academics can make such a difference. The reality is that after two years we have doubled sales and quadrupled profits."* At Anaco Systems and Beverston Engineering new organisational strategies were conceived and implemented in order for each firm to be able to more nimbly respond to, and routinely deal with, customer orders for higher-volume, lower-variety products and services. A start-up plan for Weld

Process, a new business, was created. IT strategy development and its implementation resulted in radical and positive changes to working practices at companies including Abbey Engineering, Fergusson Joinery, Halo Laboratories, Hawke Engineering and Huyton Heat Treatments. Examples include new e-commerce strategies developed for Seasoned Pioneers and IDM Engineering which allowed the companies to have a much greater control of their on-line presence and provided vital new sales channels. Conspicuous changes to working practices were designed and implemented at AMF Engineering where the lead time of a key assembly process was reduced by 40%, at Haywood & Jackson where a new job costing procedure provided the stimulus for a more profit-focused approach to business transactions causing the owner to remark that *"[UoL] have made a significant contribution to the running of the business and our interaction with customers and suppliers".* At Lift, Turn & Move where a new approach to lean thinking reduced production times by over 15% and at Hi-Tech Steel where a new operations strategy allowed the company to compete effectively on price while maintaining product and service quality. New quality management systems and procedures were implemented at MHA Integrated Electronics, MHA Lighting and Oxton Engineering, and innovative new production and measurement technologies were implemented at Croft Engineering Services and Moorgate Engineering.

- **Workforce impact**: The impact of the LAM also reaches into the wider workforce with effects that extend within and beyond the SMEs. First, entrepreneurial competencies and aspirations of owner-managers have been shaped and re-invigorated from a wide range of mentoring, assisting and coaching activities most notably at Abbey Engineering, AM Robotic Systems, Anaco Systems, BTR, Future Safety and Millennium Supplies. The work has also led to continuous funding from regional bodies in addition to funding from knowledge transfer partnerships (KTP), and European and national research programmes. Two LAM KTP programmes have led to "business leader of tomorrow" awards for ULMS' associates most recently at Hi-Tech Steel in 2009. Second, direct employment effects in the form of jobs saved and secured are evident; for example, across our range of over 75 SMEs 31 new jobs have been created and 117 jobs have been safeguarded as a direct consequence of LAM projects (see the SME dataset referred to in section 5), with all the implications that this has for those employees and their dependents. By way of examples, some of the most notable employment effects have occurred at Anaco Systems where 2 new jobs were created and 5 safeguarded and Haywood & Jackson where 5 jobs were created and 9 were safeguarded.

5. Sources to corroborate the impact

1. The Assistant Director at the Department for Business, Innovation & Skills North West can be contacted to comment on the alignment of the agility research with regional priorities.

2. The Chief Executive at the North West Automotive Alliance can be contacted to confirm the relevance of the research, and the value of its application, to automotive networks within the region.

3. The Managing Director at AMF Engineering can be contacted to confirm the impact of the research on manufacturing performance at AMF Engineering.

4. The Managing Director at Oxton Engineering can be contacted to confirm the impact of the research on production and quality processes at Oxton Engineering.

5. The Finance Director at Haywood & Jackson can be contacted to confirm the transformative effect of the research on the operations and working practices at Haywood & Jackson.

6. The SME dataset at http://agilitycentre.com/Jobs.htm. This is a collection of SME statements corroborating the claims for business and workforce impact.