

# Implementing lean through a tiered response: the Lean Business Offer

Paul Coughlan ([coughlnp@tcd.ie](mailto:coughlnp@tcd.ie))  
School of Business, Trinity College Dublin, Ireland

Brian Fynes  
Smurfit Business School, UCD Dublin, Ireland

Richard Keegan  
Enterprise Ireland, Ireland

Ann Ledwith  
University of Limerick, Ireland

## Abstract

With a particular focus on manufacturing firms in Ireland, this paper explores the overall question: *How can the support of lean initiatives in firms be delivered and how is the progression from one stage to the next evident in practice and performance?* The aim of this research is to contribute to the literature on lean capabilities and their progression towards maturity. The research explores an approach at national level for the development and application of systematic and programmatic tiered interventions to encourage dynamic learning and the development of lean organisational capabilities.

**Keywords:** Operations improvement, benchmarking, government intervention, lean operations

## Introduction

Lean is about continuous learning. In that respect, it is a journey and not an arrival point. However, as with any journey, we need to know the starting point and also how to progress from one stage of the journey to the next. In this paper, we explore this operations improvement challenge in the manufacturing sector at a national level. With a particular focus on manufacturing firms in Ireland, we explore the overall question:

*How can the support of lean initiatives in firms be delivered and how is the progression from one stage to the next evident in practice and performance?*

The research builds on Voss, Blackmon, Cagliano, Hanson and Wilson, (1998) and Netland & Ferdows (2014). Each brings a different but related perspective to the starting point. Voss et al. explored the implementation of manufacturing practices in SMEs in Britain and Italy. They concluded that a successful and growing community of SMEs needed to adopt progressively practices, such as lean production, of larger world-class companies. They recommended that policies aimed at encouraging or sustaining employment growth in SMEs ought to address both the diffusion of such practices and special support for the smallest among them. This work raises the challenge in practice

of diffusion of capabilities and the ways in which SMEs might be enabled. Netland and Ferdows (2014) explored the implementation of corporate “lean” programmes focused on finding and eliminating unproductive activities while increasing value creation. They argue that the relationship between a plant’s maturity in a production system implementation and its resulting performance was significantly positive and that it followed roughly the shape of an S-curve. The S-curve pattern implies that the rate of improvement in the plant’s performance changes in the shape of a normal distribution (the first derivative of the S-curve) as the plant becomes more mature in implementing the production system. In general, its performance improves slowly at first, and then at an increasing rate until the rate reaches a maximum level - after which the performance still continues to grow, but at a decreasing rate. Although performance remains at a high level, the rate of its improvement gradually decreases. In this context they identify four stages of plant maturity along the S-curve:

1. Beginner plants
2. In-Transition plants
3. Advanced plants
4. Cutting-edge plants

This characterisation of stages is insightful in general and helps with the formulation of the following research questions specific to SMEs:

*RQ1: How does the nature of the lean programme intervention impact on the path of progression in an SME? In particular, how do tiered interventions move the SME along the path of progression?*

*RQ2: Do contextual factors (size, industry sector) impact on the pace of progression?*

*RQ3: What patterns of improvement in performance are in evidence?*

The aim of this research is to contribute to the literature on lean capabilities and their progression towards maturity. The research explores an approach at national level for the development and application of systematic and programmatic tiered interventions to encourage dynamic learning and the development of lean organisational capabilities.

### **Implementing Lean**

The literature on lean is extensive. The introduction of a lean approach to management requires the development of understanding and capability (Wynton & Payne, 2013). This, in turn, requires a structured intervention consistent with a stepwise approach towards the elimination of waste. So, implementation of lean is not an instantaneous transformation within the firm. For example, Mostafa, Dumrak and Soltan (2013) identified nine factors to achieve lean implementation: expert team building, situational analysis, lean communication planning, training process, lean tools, value stream mapping, lessons learned review, lean assessment, lean sustaining. These factors are of relevance over a number of phases of implementation such as, conceptualisation, implementation design, implementation and evaluation, and complete lean transformation. Lean implementation has impact on different parts of the operation including inventory turnover (Demeter & Matyusz, 2011), short-term and long-term (Done, Voss & Rytter, 2011). Taylor, Taylor and McSweeney (2014) proposed that the interaction between the operational deployment of lean and the associated (and often hidden) human issues is central to the long term survival of the socio-technical system. As the boundaries of this system extend beyond the firm, lean implementation can change in character from a continuous or strategic improvement within the firm, to collaborative improvement or collaborative strategic improvement between firms (Coughlan & Coughlan, 2011). In this network context, the relationships among the firms

are not of a single character and may be strategic, learning or transformational. Learning networks of firms, of interest here, act as loosely-coupled peer systems and aim at increasing knowledge or capacity to act.

The established logic is that the journey to lean is located in an operations improvement context, involving the focal firm, its customers and suppliers. In order to embark on the journey, a level of readiness is required. Implementation has been explored in a variety of settings, from which we can learn. Finally, impact is observable in a number of ways.

### **The Lean Journey**

Hayes and Wheelwright (1984) were among the first OM scholars to use the journey metaphor with their four-stage model of the role of manufacturing. Ferdows and De Meyers' 'sand cone' model of cumulative competitive capabilities extended this pioneering work and more recently Rosenzweig and Roth (2004) proposed a theory of competitive progression. They posit that each generic capability (conformance quality, delivery reliability, volume flexibility and low cost) increases operational know-how and reduces non-value-added directly and/or indirectly through the enhancement of successive capabilities in the progression, which in turn improves profitability.

Similarly, scholars have attempted to conceptualise progress on the journey to lean. For example, Nightingale and Mize (2002) developed and tested a lean maturity model which structured progress on the lean journey into three stages: the first stage is *Lean Transformation/Leadership* which assesses the leadership of an enterprise and their ability to effect a transformation to a lean enterprise. The focus is on the lean practices and processes that are developed and maintained at the top level to guide the activities of the organization. The second stage is *Life Cycle Processes* which address the level of lean implementation on those processes that directly determine the value provided to customers. The degree to which an enterprise is successful in both making these processes lean and in integrating them across the value stream is a measure of its effectiveness and efficiency. The third stage is *Enabling Infrastructure Processes* support the execution the earlier stages by providing support to other organizational units whom they serve as internal customers.

Netland and Ferdows (2014) build on this maturity model suggest there are competing arguments for how a plant's maturity in a lean implementation could affect its performance. They posit that if a lean program were a journey of incremental improvement, one would expect a linear relationship between implementation and effect on performance. Alternatively, the "low-hanging fruits" argument suggests that as a plant becomes more mature in an implementation, the rate of performance improvement would decrease. And contrary to this, it is possible that as initial resistance to change decreases and a plant becomes more mature in its implementation, its performance should improve more quickly, rather than more slowly.

Rather than focus on performance as success, Done et al. (2011) conclude that interventions such as lean should be seen primarily as capability building processes and their success should be measured in terms of the achievement, deployment and sustainability of these capabilities rather than being about the implementation of a set of practices. They further argue that lean interventions are unlikely to develop sufficient capability for long-term success in SMEs without on-going support.

In conclusion, there is some consensus and debate about progress on the journey to lean. Our analysis will provide some insights into questions relating to finding the optimal route, the rates of progression, where to change 'gear' and identifying and arriving at the correct destination.

### **Design/ Methodology/Approach**

The empirical work underpinning the paper was conducted in a set of manufacturing firms who engaged in an initiative, the Lean Business Offer (LBO). The LBO is a three tiered approach taken by Enterprise Ireland (EI) to help indigenous firms to address their competitiveness issues. EI is the State body charged with the support and development of indigenous industry, and of multi-national corporations using natural resources. The LBO is designed from the outset as an action research-based initiative to help firms to improve their performance and competitiveness across all areas of the business using Lean Principles (Keegan, 2000). The design also seeks to validate the assertion by Voss et al(1998) that State entities can act as a positive means of achieving performance development in industry through the introduction of improved practices. The LBO has three distinct tiers, each at a different level of intensity:

Lean Start – 7 day interaction, over 1-2 months,

Lean Plus – 3-6 months of activity,

Lean Transform – Over 2 years activity.

The Irish State assists firms financially on their Lean journeys, through the LBO, and receives impact reports on their efforts and results. Firms work with their designated EI client relationship staff member to identify their suitability for the LBO and at what level, Lean Start, Lean Plus or Lean Transform. Firms are then encouraged to interview and select a suitable consultant from an EI directory. Consultants have to show that they have experience and expertise with Lean implementation before they are accepted on to the directory. Also, EI convene spring and Autumn Fora where the progress of the programme is discussed with the consultants and where issues and opportunities are considered. For the Lean Transform cases a multi skilled core team from EI typically engage with the leadership team in the client firm to achieve a consensus on the scope and the focus of their proposed Lean Transform activity, before they interview and select their consultants. The underlying rationale is that this scoping and consensus building before consultant engagement helps ensure that the topics and areas chosen for improvement activities are the central issues and challenges for the business.

The offer is explained graphically as a “Spiral of Improvement” as opposed to the more traditional way of describing continuous improvement, such as “Circles” of Plan-Do-Check-Act. The spiral of improvement represents progress, upwards and outwards as firms develop the capability and capacity of their people and processes. The availability of the three tiers offers the firms the possibility to engage at discrete levels or to continue from one level to the next over a period of time. Engagement and progression is facilitated.

The data examined in this study include LBO level, timing and duration of engagement, and performance metrics including cost savings, output capacity, turnover, achieved and planned improvements. These data were provided by the participating firms directly to EI. The resulting dataset formed the basis for the study.

### **Findings**

To date, some 520 firms have participated in the LBO programme, within which 670 projects have been supported by EI. As such, a number of firms have undertaken more than one project. We summarise the patterns of engagement before exploring the differences in observed performance and impact of that engagement.

*Firms engaging in a project at one LBO level only:* Firms exhibited different starting points and engaged at different levels of the programme. 392 firms participated in one

level only of the LBO. However, not all of these firms participated at the Start level. Rather, the distribution was as follows: Lean Start: 283; Lean Plus: 65; Lean Transform: 44. This distribution would suggest that relatively few firms were developed enough to engage for the first time at the highest level within the programme. As such, a broad developmental focus of the programme rather than a selective emphasis on a limited set of high achievers is evident.

*Firms engaging in two projects at one or two LBO levels:* 116 firms participated at two levels of the LBO programme. However, as indicated in Table 1, there were different patterns of engagement.

*Table 1 – Firms engaging in two projects at one or two LBO levels*

<b>Second Programme</b>	<b>Start</b>	<b>Plus</b>	<b>Transform</b>
<b>First Programme</b>			
<i>Start</i>	9	81	14
<i>Plus</i>		2	7
<i>Transform</i>			3

The above table shows that nine firms did two Lean Starts, 81 firms did a Lean Start first and then did a Lean Plus. Finally, 14 firms did a Lean Start first and then a Lean Transform, skipping the Lean Plus level. Similarly, two firms did two Lean Plus projects, while seven did Lean Plus before progressing to Lean Transform. Finally, three firms did two Lean Transform projects.

*Firms engaging in three projects at one, two or three LBO levels:* Finally, 11 participated in three projects at one or more LBO levels, as indicated in Table 2.

*Table 2 – Firms engaging in three projects at one, two or three LBO levels*

<b>Firm</b>	<b>Start</b>	<b>Plus</b>	<b>Transform</b>	<b>Dates</b>
1		2	1	2010, 2011, 2013
2	1	1	1	2012, 2013, 2014
3	1	1	1	2011, 2011, 2013
4	3			2010, 2012, 2012
5	1	1	1	2011, 2011, 2013
6	1	1	1	2012, 2013, 2014
7	1	1	1	2010, 2011, 2012
8	2	1		2010, 2011, 2013
9	1	1	1	2011, 2011, 2014
10	1	1	1	2011, 2012, 2014
11	1	1	1	2010, 2011, 2013

Within this cohort, eight firms engaged progressively in the three LBO levels at differing rates. One firm began at the Lean Plus level, completing two projects in the one year before moving on to Lean Transform. Finally, one firm engaged at Lean Start level on two projects before moving on the Lean Plus while one firm engaged at Lean Start level only on three projects.

*Performance:* We explored the differences between the firms who completed a Lean Start project and nothing further and the firms who began with a Lean Start and then followed it with a Lean Plus. We extracted the 283 firms who did a Lean Start only and

the 81 firms who did a Lean Start followed by a Lean Plus. For each of these groups of firms we identified four indicators of performance Annualised Cost Savings, Cost Savings as % of Sales, Cost Savings as % of COGS, and Ratio of % Sales to % COGS Savings. The comparisons are summarised in Table 3.

*Table 3 – Level of Engagement and Performance*

<b>Level of engagement</b>	<i>Start only (283)</i>	<i>Start and Plus (81) Start Result</i>	<i>Start and Plus (81) Plus Result</i>
<b>Performance</b>			
<i>Annualised Cost Savings</i>	Mean: €69,757 (85) Median: €39,000 Max: €1,000,000 Min: 180	Mean: €70,400 (32) Median: €31,000 Max: €500,000 Min: €280	Mean: €182,425 (30) Median: €127,500 Max: €800,000 Min: €360
<i>Cost Savings as % of Sales</i>	Mean: 5% (65) Median: 2% Max: 45% Min: 0%	Mean: 3% (29) Median: 2% Max: 14% Min: 0%	Mean: 4% (27) Median: 3% Max: 15% Min: 0%
<i>Cost Savings as % of COGS</i>	Mean: 7% (64) Median: 4% Max: 50% Min: 0%	Mean: 3% (24) Median: 2% Max: 10% Min: 0%	Mean: 7% (29) Median: 4% Max: 19% Min: 1%
<i>Ratio of % Sales to % COGS Savings</i>	71%	100%	100%

A number of observations may be made on the data. First, the mean annualised cost savings from their initial Start project are more or less the same for firms who engaged in Lean Start only or who engaged subsequently at a Lean Plus level. However, the big difference is seen in the follow on projects, as discussed below. In contrast, these cost savings represented a higher mean percentage of sales for those who engaged at a Lean Start level only. The question emerges for further exploration: were those who progressed to Lean Plus encouraged by the higher nominal level of savings achieved or motivated to achieve cost savings as a higher proportion of sales. It could be proposed that those who engaged in Lean Start only were satisfied with the outcome and not motivated to proceed further.

Second, the firms who engaged in Lean Start before Lean Plus achieved higher mean annualised cost savings from their Plus project than was achieved at the Lean Start level. In addition, these cost savings represented a higher mean percentage of sales than was achieved at a Lean Start level. These observations support the proposition that a tiered or phased approach seems to move the firms along the path of progression. The question emerges for further exploration: were those who progressed to Lean Plus encouraged by an emergent understanding of the underlying cost saving potential and a greater confidence in working to achieve this potential

*Other Impacts:* For the purposes of this paper, the 11 firms who engaged in three projects at one, two or three LBO levels were examined for evidence of impact other than cost savings. Figures 1 and 2 illustrate these impacts.

In Figure 1, the reported increases in productivity range from 5% to 45%. It is interesting to note that those who engaged progressively in the three levels differed in the level of productivity increases. Similarly, the firm which engaged in three projects at

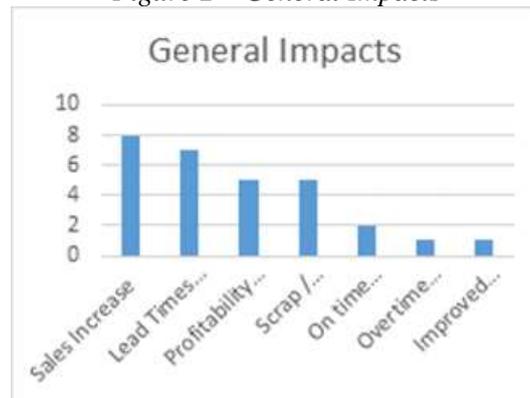
Lean Start level achieved one of the highest productivity increases. Further exploration of the data will be required to understand the contributors and inhibitors of these increases.

Figure 1 – Productivity Increases



Similarly, other impacts were observed across the 11 firms which were attributed to their participation in the LBO programme, illustrated in Figure 2. Among these impacts, sales, lead times, scrap and on time delivery improvements were observed in more than half of the firms. Further exploration of the data will be required to understand the linkages among these impacts and their sustainability.

Figure 2 – General Impacts



### Relevance/Conclusion

In this paper, we explored the question: *How can the support of lean initiatives in firms be delivered and how is the progression from one stage to the next evident in practice and performance?* Preliminary analysis of the LBO data has provided evidence that firms exhibit differing paths through the programme. Some engage at a single tier and go no further. Others migrate from one tier to the next in the sequence envisaged by the LBO developers.

The evidence suggests that the LBO programme is impactful for those firms that participate. Performance data indicate differing levels of performance which depend upon the starting point, and extent of migration from one level to the next. The areas where impact was observed included cost savings, lead time reduction and scrap. These are not particularly remarkable and would have been expected in such a context. Of greater interest, however, is the evidence of different impacts depending upon the number of projects engaged in or the sequential progression from one LBO level to the next level. This observation supports the argument that the development of lean capabilities is enabled through a tiered programme. The level, sequence, duration and timing of the journey seem to be material to the capability improvements achieved.

Further, the evidence prompts further exploration of the contention that firms who have an awareness of their capabilities improve at a faster rate and to a higher level than those firms who, for whatever reason, have unrealistic views of their capabilities.

An interim evaluation of the LBO by the Technopolis Group (Knee et al. Technopolis Group, 2013) supports these findings. They report an increase of 20% in productivity for participating firms, along with increased sales and employment. While the Technopolis report warns against un-sustained quick wins, the findings of this research suggest that continued involvement in the LBO programme results in increasing rewards – a spiral of improvement.

The paper seeks to extend the conceptualisation of path progression into the area of lean. The relevance for practice of an understanding of this progression is in two areas: firm engagement and external/government support for improvement. This paper is not written as a definitive document on the Lean activities in Ireland as our efforts are continuing and evolving. However, a number of implications for practice emerge. There is value in a state-supported firm-centric approach to lean implementation. Firms are at different stages in their evolution and have different needs, wants, experiences and histories. Efforts to help them to improve manufacturing-based competitiveness needs to be aligned with their evolving capabilities and to challenge them systematically at different programmatic levels. The delivery of these efforts requires the provision of a “support” structure for firms over time. This longitudinal support and external challenge helps management and staff to progress from initial enthusiasm for Lean into a pattern of systemic change where continuous improvement becomes the norm.

## References

- Coughlan, P. & Coughlan, D. (2011), *Collaborative Strategic Improvement through Network Action Learning: The Path to Sustainability*, Cheltenham, Edward Elgar
- Demeter, K. & Matyusz, Z. (2011) The impact of lean practices on inventory turnover, *International Journal of Production Economics*, 133 (1), 154-163
- Done, A., Voss, C.A. & Rytter, N.G. (2011), Best practice interventions: short-term impact and long-term outcomes, *Journal of Operations Management*, 29 (5), 500-513
- Ferdows, K. & De Meyer, A. (1990) “Lasting improvements in manufacturing performance: in search of a new theory” *Journal of Operations Management*, 9 (2) 168-184
- Hayes, R.H. and Wheelwright, S.C. (1984) *Restoring Our Competitive Edge: Competing Through Manufacturing* Wiley, New York
- Keegan, R. (2000) Improving SME Operational Performance using Benchmarking and World Class Networks, PhD dissertation, National University of Ireland-Galway
- Knee, P., Rosemberg, C., Quas, A., Farla, K., & Arnold, E. (2013), Evaluation of Enterprise Ireland Productivity Support Programmes: Interim Evaluation of Enterprise Ireland's Lean Business Offer (2009-2012)' Technopolis Group.
- Mostafa, S., Dumrak, J. & Hassan Soltan (2013), A framework for lean manufacturing implementation, *Production & Manufacturing Research* 1 (1)
- Netland, T. & Ferdows, K. (2014) “What to expect from a lean corporate programme”, *Sloan Management Review*, Summer, 82-89.
- Nithingale, D. & Mize, J. (2002) “Development of a lean enterprise transformation maturity model”, *Information, Knowledge and Systems Management*, 3, 15-30
- Rosenzweig, E. & Roth, A. (2004) “Towards a theory of competitive progression; evidence from high-tech manufacturing”, *Production & Operations Management*, 13 (4) 354-368.
- Taylor, A., Taylor, M. & McSweeney, A. (2014), Towards greater understanding of success and survival of lean systems, *International Journal of Production Research*, 51 (22)
- Voss, C., Blackmon, K.L., Cagliano, R., Hanson, P. & Wilson, F. (1998). Made in Europe: Small Companies. *Business Strategy Review*, 9(4), 1-19.
- Wynton, P. & Payne, R. (2014), Exploring the development of competence in Lean management through action learning groups: a study of the introduction of Lean to a facilities management function, *Action Learning: Research & Practice* 11 (1).