

Action Research using Case Study Methodology for Implementation of Process Improvement Initiatives in Food SMEs

*Anita Kumar, Seamus O'Reilly (S.OReilly@ucc.ie) & Fred Adam,
University College Cork, Ireland*

Abstract

Purpose:

In the last decade, operations management researchers have been encouraged to consider action research (AR) case methodology as a suitable research approach to investigate unstructured organisational problems (Na'slund, 2002). The epistemology of AR methodology resonates well with a Continuous Improvement (CI) philosophy (such as Lean) as both emphasise collective learning, critical reflection and change/improvement. Lean is associated with 'elimination of waste' and reducing variability in supply processes (Shah and Ward, 2007). However, certain critical aspects of Lean such as responsiveness to consumer demand and strategic and operational alignment are not as well recognised in academic publications. Increasingly attention has focused on waste, flow and burden and thus we find a renewed emphasis on 'people' (Hines *et.al.*, 2008).

This paper reports on the use of AR methodology to implement process improvement initiatives based on Lean tools and techniques in three Irish Small and Medium-Sized food Enterprises (SMEs). Over the past few decades the pace of structural changes from 'simple to complex' and 'push to pull' has increased in the food industry (Folkerts and Koehorst, 1997). In an effort to fulfil customer demand for increased product variety, food processing SMEs have compromised on their operational efficiency and this has resulted in high costs of production. The choice between 'physically efficient' and 'market responsive' is no longer available to companies as they endeavour to build responsive and efficient supply chains (Lo and Power, 2010).

Hence the objectives of the research were twofold: to achieve enhanced process efficiency and customer responsiveness in the case companies and to expand the existing theory base of Lean philosophy by providing empirical evidence on its broad transformational orientations.

Research Protocol:

Three case studies were used in a multiple case study design. The set of cases was not treated as a statistical sample as each case had a clear identity and was chosen for its theoretical relevance (Yin, 2003). The protocol for selecting firms was based on purposeful sampling and it targeted specific types of firms in food sector based on a) size (SMEs) b) broad product variety c) diverse market demand d) 'postponement'¹ production strategy.

The process improvement initiative was a collaborative effort between the UCC research team and members of the participating companies. AR Steering group consisted of Principal research investigators, researcher and the senior management of the companies that planned the research protocol and set the appropriate time schedule. The goal was to comprehend and

¹ *The system of final modification on order refers to postponed manufacturing (Van Hoek, 1998). In a specified operating system, the final or secondary manufacturing activities are postponed until customer orders are received and performed closer to the customer, separated in time and place from large scale manufacturing or processing of generic products or components. The customer order decoupling point (CODP) where the customer order penetrates the operating system differentiates the activities of the supply chain. Downstream from this point the operations are order driven and upstream from this point, forecast driven.*

describe the complex network of interrelated supply chain activities from ‘raw material supplies to processing and deliveries’ and how these influenced each other.

This research views reality from a Critical Realist’s perception that believes that it exists in three domains; *real, actual and empirical*. The first two domains are independent of the observer. In the empirical domain, reality is interpreted by the observer and may be influenced by the lens through which it is viewed (Easton, 2002). The three domains may not be mutually exclusive theoretically but often in practice they differ; hence knowledge building is a collaborative process concerned with actions and reflections of researcher and participating members interacting in these three domains of reality.

A two-phase action research cycle was conducted in all three companies to identify, understand and clarify the deeper causes behind the ‘events’ and their consequences in each company before suggesting improvements or changes.

The research protocol is outlined in Table 1.

Phase 1	Activity	Time Line
	Presentation of scope of the project by UCC research team to case company’s management	1 day
Data Collection	Understand current state of the supply chain <ul style="list-style-type: none"> • Semi structured interviews • Process Activity Mapping • Examination of Historical Records 	up to 7 days
Data Analysis	Identify issues Propose solutions	30 days
	Present report to the company’s senior management and conduct informal discussions regarding implementation of solutions	1 day
Phase 2	Implementation of solutions by the company	60 days
Data Collection	Track progress and record changes <ul style="list-style-type: none"> • Semi structured interviews • Company Documents 	up to 3 days
Data Analysis	Analyse data and write individual case study report	6 months
	Cross Case Analysis and present final report	

Table 1: Action Research Protocol followed

Events in each company included production plan non-adherence, high inventory levels, high number of SKUs, long supplier lead time (Case A), worker training & development (Case B) and large-lot size production (Case C). These events were the outcomes of external and visible behaviours of people, systems and things as they occurred. Several Lean Mapping tools such as Product Family Mapping, Value Stream Mapping and Supply Chain Time Line were used to expose them. However the generative mechanisms that created these events resided in the ‘real’ domain of reality and Cause and Effect Analysis and ‘*why-why-why*’ technique were used to understand them as well. For example production plan non-adherence

in all the three companies was due to internal (inefficient production process) and external complexities (variability in supply and demand) in the order fulfilment process.

Process improvement initiative was not limited to factory-floor level but also involved strategic planning, management thinking and formulation of a customer value-add strategy. Data collection tools included: semi-structured interviews with managers at different organisational functions and levels, analysis of the company's documents and mapping of order fulfilment processes. During both phases of research, feedback was taken from the managers of case companies as these clients knew their organisation best. The managers and employees were responsible for implementing suggested solutions and following through the actions. The researchers acted as facilitators and provided non-directive support. At 'meta'² level, monitoring was done by the principal investigator all through the AR cycle of planning, implementing and evaluation. As processes and outcomes were *literally* replicated across multiple settings, generalisability was enhanced.

Findings:

Positive results (decreased inventory levels; better production plan adherence and level scheduling; reduction in supplier lead time; improved customer service levels and rationalised product variety) from all three case companies indicate the validity of action research case methodology for implementing process improvement initiatives in SMEs. The results are summarised in Table 2.

Operational ³ Measures	Case Study A		Case Study B		Case Study C	
	Before	After	Before	After	Before	After
Lean						
Production Plan Adherence	X	Weekly	X	Weekly	X	Weekly
Flow Oriented Layout	yes	yes	X	planned	yes	yes
Multi-skilled teams	yes	yes	X	yes	yes	yes
Supplier Relationship	30 days	21 days	yes	yes	30 days cycle	15 days cycle
Inventory Planning	X	R*	X	R*	X	R*
Agile						
Product Mix Flexibility	yes	yes	yes	yes	yes	yes
Volume Mix Flexibility	yes	yes	yes	yes	X	yes
Broad Product Variety	yes	R*	yes	R*	yes	R*
New Product Development	yes	yes	yes	yes	yes	yes
Customer Service Level	95%	100%	100%	100%	90%	

- Rationalised

Table 2: Results of the process improvement initiatives of three case companies

² Coughlan and Coghlan (2002) suggest three stages of AR cycle- (i) pre-step to understand context and purpose (ii) six main steps –gather, feedback, analyse data, plan, implement and evaluate action and (iii) an interactive meta-step to monitor.

³ These parameters are based on discriminating characteristics of Lean and Agile. These were used to analyze supply chain efficiency and responsiveness of food SMEs and were measured before and after the process improvement initiative in each case to achieve construct validity.

The results also demonstrate the 'holistic' nature of Lean philosophy and importance of effective management of people, processes and inter-organisational relationships in the supply chain. In case A, it was possible to improve the visibility and velocity of the supply chain by breaking functional 'silos' and reducing supplier lead time. In case B, improvements were achieved in the areas of: documentation of production procedures, decentralisation of authority and integration of workforce in the company's improvement process. In case C, revision of production planning and scheduling process led to decreased finished goods inventory levels and better conformity to production plans.

Thus these findings contribute to theory testing and building on Lean and in particular support the role of not only tools and techniques but also the importance of leadership and behavioural change in successful continuous improvement.

Research impact:

By following a structured, robust and time-bound research protocol and maintaining journal documents and records, this research addresses the supposed weakness/pitfalls associated with AR such as lack of scientific rigor and discipline; unique and contextual nature of findings and lack of impartiality of researcher. Use of a multiple case study design in this study demonstrates that it is possible to theoretically generalise the research findings in a particular sector making action research a powerful 'alternative' methodology in operations management.

Practical impact:

This paper would be of interest to industry practitioners seeking a rigorous methodology to implement self-driven organisational changes. Although owner/managers in SMEs want to avail the benefits of formal process improvement initiatives, they are constrained by a lack of financial, technical and manpower resources. In addition, there is a general perception that Lean initiatives are costly and time consuming. This study demonstrates the effectiveness of implementing small incremental changes and developing an organisational culture of continuous improvement consistent with both Lean and Action Research philosophy.

Keywords: Food SMEs, action research, case study methodology, process improvement initiatives.

References:

Coughlan, P. and Coughlan, D., (2002) "Action Research: Action research for operations management," *International Journal for Operations and Production Management*, Vol. 22, No. 2, pp 220-240.

Easton, G. (2002), "Marketing: A critical realist approach", *Journal of Business Research*, Vol. 55, No. 2, pp. 103-9.

Folkerts, H. and Koehorst, H. (1997)," Challenges in international food supply chains: vertical coordination in the European agribusiness and food industries", *Supply Chain Management*, Vol. 2, No.1, pp1-14.

Hines, P., Found, P., and Harrison, R., (2008), *Staying Lean: thriving, not just surviving*, Lean Enterprise Research Centre, Cardiff University, Cardiff, ISBN 0902810111

Näslund, D. (2002), “Logistics needs qualitative research – especially action research”, *International Journal of Physical Distribution & Logistics Management*, Vol. 32, No. 5, pp. 321-38.

Lo, S. and Power, D. (2010), ‘An Empirical Investigation of the relationship between product nature and supply chain strategy’, *Supply Chain Management: An International Journal*, Vol. 15, No. 2, pp139-153

Shah, R. and Ward, P. (2007), ‘Defining and developing measures of lean production’, *Journal of Operations Management*, Vol.25, pp 785-805

Womack, J.P. and Jones, D.T. (1996), *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*, Simon and Schuster, New York, NY.

Van Hoek, R.I., Commandeur, H.R. and Vos, B. (1998), “Reconfiguring logistics systems through postponement strategies”, *Journal of Business Logistics*, Vol. 19, No 2, pp 33-54.

Yin, R.K. (2003), *Case Study Research: Design and Methods*. Sage, London.

