Defining Lean Change—Framing Lean Implementation in Organizational Development

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Abstract

Problem – When lean is adopted in traditional organisations it requires a widespread organisational change and many businesses fail to sustain lean practices. **Purpose** – The purpose of this work was to define lean implementation based on the organisational development (OD) body of knowledge. **Approach** – The literature in lean and organisational change was reviewed and amalgamated to develop a novel conceptual framework. **Findings –** Lean implementation begins with a planned changed that is episodic. However, the ultimate goal is to develop a learning organisation where change is continuous and emergent from all levels. Respect for people, everyone in the organisations contribution, is considered key to successful implementation of lean. **Implications**– Practitioners should not focus on isolated improvements, but foster change from within for a sustained transformation to become a lean learning organisation. **Originality** - This paper provides new insights into lean implementation and its transformative effect on the organisation. A novel conceptual model is presented that frames lean transformation within the organisational development literature.

Keywords: lean; management; production, organisational development, change

1. Introduction

Lean is a management strategy that emerged from Japanese manufacturing, focusing on creating value through continuous improvement, and the elimination of waste (Shingo, 1989; Ohno, 1988; Womack & Jones, 1996; Hines, Found, Griffiths, & Harrison, 2008). Minimising wasteful action means fewer resources are required; whilst lead times decrease and quality increases. Lean manufacturing or lean production is now more broadly called lean management (Emiliani, 2006) with its application established well beyond manufacturing to enhance business practice universally (Womack & Jones, 1996).

When lean is adopted in traditional organisations, it requires a widespread organisational change. However change management is intrinsically difficult so businesses regularly fail to sustain the necessary lean practices. Although lean has proven to be customisable to many different business types (Womack & Jones, 1996; Hines et al., 2008) these issues still remain. The large numbers of failed or struggling instances necessitate research with emphasis in the area of organisational change.

This paper develops an organisational development framework for the implementation of lean.

2. Method

The purpose of this work was to define lean in the context of organisational development and thereby provide further insights into the mechanism of lean change.

The methodology was a traditional review of key literature in organisational change with a focus at the intersection between organisational change and lean management. This work targeted research-based and established literature more pertinent to the lean implementation and organisational change intersection. Article searches for lean were conducted iteratively combining "lean" with a variety of keywords e.g. implementation, success, contingency, factors, manufacturing, production, and management. Initially the search focused on engineering sources utilising the Compendex database and then further more broad searches using Google Scholar search (Bakkalbasi, Bauer, Glover, & Wang, 2006; Falagas, Pitsouni, Malietzis, & Pappas, 2008). Seminal research works were also identified within the literature. The literature on organisational change, change management, and organisational development were reviewed likewise.

From the review conceptual models for an OD perspective of lean transformation were developed.

3. Review

3.1 Lean Management

Lean management is becoming the standard for systematic productivity improvement (Jusko, 2012; Selko, 2012). The roots of lean are in manufacturing (Ohno, 1988; Womack, Jones, & Roos, 1990). However the methods and challenges of change are not industry specific (Balle, 2011; Bateman, Hines, & Davidson, 2014; Lander & Liker, 2007; Womack & Jones, 1996). Hence the thinking may be applied and adapted to many other situations such as service (Hadid & Mansouri, 2014), food supply (Vlachos, 2015), public sector (Bateman et al., 2014; Radnor & Johnston, 2013), knowledge work (McDermott & Venditti, 2015), construction (Sertyesilisik, 2014; Tommelein, 2015), and other industries.

Still, many unsuccessful cases exist in industry. Literature reports 60% to 90% failure rates for improvement programmes (Goodyer, Murti, Grigg, & Shekar, 2011; Shin, Kalinowski, & Abou El-Enein, 1998), which is not inconsistent with failure of change in general (Kotter, 1995), referenced as 80% (Burnes, 2005). So whilst lean is operationalised to an extent (Shah & Ward, 2007) a good definition of what lean is and how to achieve its benefits has been hard to define (Arlbjørn & Freytag, 2013; Bhasin, 2011, 2015). Lean has been labelled by some as a fad, with some suggesting lean was only applicable to the mass production industry and lacking contingency beyond that (Cooney, 2002; Crute, Ward, Brown, & Graves, 2003). This critique was common to other management practices also (Sousa & Voss, 2008). In general there has been a poor understanding of contingency factors in lean implementation (Johnstone, Pairaudeau, & Pettersson, 2011; Radnor, Holweg, & Waring, 2012) and that lean as a concept has further developed (Hines, Holweg, & Rich, 2004; Womack, 2007). There is now a greater understanding of how to reap its benefits (Hines et al., 2008; Liker, 2004; Schmidt, 2011) and incorporate agility (Hallgren & Olhager, 2009). Specifically lean is being considered a holistic company culture rather just an application of tools (Hallam, Muesel, & Flannery, 2010) and respect for people is being considered as important as the process methods of eliminating waste (Emiliani, 2006; Ohno, 1988).

3.2 Organisational Development

Organisational development (OD) is a field of study and practice of the human resource aspects of the performance of organisations and the change processes necessary to achieve excellence. It covers a broad set of concepts, methods, and discourses, united in the application of principles of behavioural psychology. In the past its breadth and qualitative methods have been criticised as insubstantial, based on conjecture, hence lacking rigour (Sashkin & Burke, 1987), lacking substantiation (Weick & Quinn, 1999), and being fragmented (Buchanan et al., 2005). Others are more supportive of OD (e.g. Bordia, Restubog, Jimmieson, & Irmer, 2011), particularly its humanistic perspective of understanding change (as in Heath & Heath, 2010) which contrasts with the largely management-centric literature on change-management (Burnes, 2005). Key aspects of change have also been simplified into stage models (e.g. Kotter, 1995; Heath & Heath, 2010) and frameworks of change (Cameron & Green, 2015).

The OD field originated in the 1940's (Lewin, 1947), with leadership concepts added in the 1970's (e.g. Ackoff, 1972), breadth added in the 1980's (e.g. Ackerman, 1986; Ackoff, 1981; Sashkin & Burke, 1987), and depth added from the 1990's (e.g. Hendry, 1996; Judson, 1991; Kotter, 1995, 1998; Orton & Weick, 1990; Weick & Quinn, 1999). Key statements of the field include (Ackoff, 2003; Anderson & Ackerman-Anderson, 2010, 2001; Heath & Heath, 2010; Kotter, 1995, 2006; Kotter & Rathgeber, 2006; Macrì, Tagliaventi, & Bertolotti, 2002; Pettigrew, Woodman, & Cameron, 2001; Plowman et al., 2007; Porter, 2006; Tsoukas & Chia, 2002). For literature reviews (see Armenakis & Bedeian, 1999; Becker, 2004; Buchanan et al., 2005; Cameron & Green, 2015; Kuipers et al., 2014; Oreg, Vakola, & Armenakis, 2011; Sashkin & Burke, 1987; Üsdiken, Kipping, & Engwall, 2011).

3.3 Change Management

Kurt Lewin was an early and key contributor to change management. After World War II, Lewin (1947) developed a staged process change model that has dominated practice (Burnes, 2005; Hendry, 1996) . This was supported by his Force Field Analysis (Note 1) (Lewin, 1947). Although criticised for missing dynamic aspects of change and the fluidity of an organisation (Burnes, 2005; ref. Kanter, Stein, & Jick, 1992), Lewin's concepts have had an enduring effect on the field. Change management posits the existence of two main types of change, planned and emergent. Planned change is episodic as opposed to continuous change which is emergent.

A planned change is episodic because it involves discrete events in time planned out and then implemented. This type of change is associated with stage models where change has discrete stages. Kurt Lewin's (1947) stage

model of change (unfreeze, transition, freeze) is the classic in this field of organisational development (Burnes, 2005).   Once the change is identified, the current state is unfrozen and the change is driven from the top-down. After this, efforts are made to sustain or freeze the change. This may be done by policy (Lewin, 1947; Burnes, 2005).

This traditional method tends to be management centric and is criticised by the emergent change proponents (Burnes, 2005; Tsoukas & Chia, 2002; Weick & Quinn, 1999). The top-down approach has issues of resistance and lack of engagement of staff (Heath & Heath, 2010) (Weick & Quinn, 1999). In the planned approach top management can wrongly assume superior knowledge, omniscience, or belief that the authority of their role validates their vision and planning. Also, the planned approach tends to favour stability, over on-going change. In the planned approach stability is achieved as change is only an epiphenomenon and not endogenous (Tsoukas & Chia, 2002). This kind of episodic change involves stages of equilibrium that need to be broken to transition to a new equilibrium (Weick & Quinn, 1999). It involves a significant change from one state to another overcoming inertia along the way (Üsdiken et al., 2011). Stability without change could be seen as beneficial and desirable in some bureaucratic organisations (Liker, 2004, p. 144), however in recent decades there has been a clear call for higher levels of change within organisations in order for them to remain competitive.

From the 1950's to the 1980's the planned approach to change prevailed. Continuous and emergent change theories developed thereafter in response to need for quicker, more sustainable, and deeper change. Modern organisations need to be flexible and organic, able to adapt quickly. Continuous innovation required emergent change from within the organisation. This is the dynamic change needed for survival and prosperity in fast-changing competitive markets (Burnes, 2005). Continuous change proponents take the view that change is, and should be, on-going within an organisation. Change in organisations does not need to be planned and discrete, but can emerge continuously. In fact, change is occurring in organisations all the time (Weick & Quinn, 1999) emerging to various degrees and from various levels not only from executives. True emergent change would be change occurring continuously from all levels as opposed to merely top-down planned change. In these situations, the speed at which change can take place is potentially much greater. To achieve this evolving change the authority to change a thing is distributed to those with the most information regarding that thing e.g. a production worker. Flat flexible structures that allow for this type of *culture excellence* are called for. Such organisations operate as complex non-linear systems with unpredictable change outcomes but are governed by simple rules for allowing operation at the *edge of chaos* i.e. at the condition for maximum amount of allowable and on-going change (Burnes, 2005).

Emergent change is dynamic, continuous, and on-going whereas the episodic concept is a matter of replacing the old with the new. A planned or episodic change is therefore only contemplated when adoption lags (Weick & Quinn, 1999).

Continuous change is about a continuum of adaption rather than discrete events of planned change. Complexity theories for emergent change challenge the assumption of linearity and instead propose constant change interacting through a network of feedback loops (Plowman et al., 2007). It is suggested that novelty can only emerge from such instability (Sashkin & Burke, 1987).

3.4 Organisational Learning and the Learning Organisation

The concept of a learning organisation was publicised by Senge (Senge, 1990). Organisational learning, a development of emergent change, has close ties with continuous improvement (Murray & Chapman, 2003) and Kaizen (Imai, 1986). A definition of a learning organisation is per (Pedler, Boydell, & Burgoyne, 1989, p. 2), "an organisation which facilitates the learning of all of its members and continuously transforms itself".   It is an organisation whose learning capabilities have become excellent, but specifically implies management has intervened such that the organisation will continuously learn (Tsang, 1997). Double-loop verses single-loop learning (Argyris, 1977) is a particularly key concept in the learning organisation (Senge, 1990), especially as related to lean (Hines et al., 2008). Single-loop learning implies repeated attempts at the same problems without adjustment. It implies a short term solution for a problem that may arise in the future. Double-loop learning implies a modification that occurs to change the method and goal or even reject the goal.   The learning organisation is attributed five characteristics: systems thinking, personal mastery (individual commitment to learning), mental models (values, assumptions, boundaries, and norms need to be open to change), shared vision, and team learning, see Senge (1990). Although Senge's perspective is challenged (Caldwell, 2012; O'Keeffe, 2002), the promoting and facilitating of learning within the organisation, being integrated into the systems of the organisation, even   the forcing of learning, was observed in the Toyota Production System (TPS) and seen as key to lean success (Hines et al., 2008; Liker, 2004; Ohno, 1988).

This concept has been particularly beneficial in explaining the dynamics and systems of genuine lean continuous improvement, even describing a goal future state for an enterprise, i.e. becoming a learning organisation (Dahlgaard & Dahlgaard-Park, 2006; Hines et al., 2008, 2004; Lee, Bennett, & Oakes, 2000; Liker, 2004; Ricondo & Viles, 2005). Its core concepts allow for useful dialogue, and communicating key complexities of lean.

3.5 Lean Implementation

Lean implementation involves a transformation. Its purpose is to produce sustained continuous improvement, with the culture excellence sought after by emergent change proponents (Burnes, 2005; Sashkin & Burke, 1987; Tsoukas & Chia, 2002; Weick & Quinn, 1999). Much of the benefit or power of a lean business is attributed to its becoming this kind of dynamic, learning organisation (Hines et al., 2008; Liker, 2004). In such an organisation culture is cash and a true defendable competitive advantage (Spence, 2012). This is the way that a company moves towards the goal of perfection (Ohno, 1988; Womack & Jones, 1996).

The process of a typical lean implementation (Rivera & Frank Chen, 2007), starts with value stream mapping (VSM) to define the journey of improvement and then uses 5S to organise the workplace (sorting, straightening, systematic cleaning, standardizing, and sustaining). 5S is a typical first step in implementing lean. It is easy for anyone to understand that organising the workplace can improve efficiency. Following this, specific tools are generally prescribed to improve the processes. These might include Standard work, single minute exchange of dies (SMED), total productive maintenance (TPM) and Jidoka (intelligent automation). A further level of implementation would be pull of inventory with just-in-time (JIT) systems and heijunka (level scheduling).

Given these readily available tools and an understandable process, a business which is supported by a consultant can readily embark on a lean journey. Unfortunately an over-focus on tools and quick solutions is unlikely to be successful if the underlying principles of lean have been ignored (Womack, 2007). There needs to be a strategic perspective and a culture of sustainability (Hines, 2010). Implementation failures become negative experiences, contribute to a perspective that the tools were fads, and hinder future attempts at continuous improvement. The resistance that results from unsatisfying experiences is confirmed by the organisational development literature (Bordia et al., 2011) along with the high failure rate for change (Burnes, 2005; Kotter, 1995). The use of consultants also must be addressed. Often consultants are used to achieve a temporary success by applying specific tools to some processes but overall effectiveness is limited. This failure is considered a lack of a business's actual understanding and assimilation of what lean is about and coinciding failure to become a learning organisation (Hines et al., 2004; Dahlgaard & Dahlgaard-Park, 2006; Liker, 2004; Gino & Staats, 2015).

The contemporary research states, that for lean to truly have impact there is a need of an enterprise wide understanding that is embedded in the company culture starting with leadership to build a learning organisation (Boyle, Scherrer-Rathje, & Stuart, 2011; Hines, 2010; 2008; Liker, 2004; Womack & Jones, 2003). The extent to which lean thinking in an organisation reaches this level of understanding, affecting the internal culture and eventually external supplier cultures, indicates the extent to which the benefits of lean will be seen in that organisation. As Boyle et al. (2011, p. 594) comments:

In order to truly understand the extent of lean adoption, it is critical to not only capture the piecemeal usage of individual lean techniques (e.g. single-minute exchange die/setup time reduction, 5S), but also the existence of the higher level strategic orientation and philosophy that represents lean thinking.

Schmidt (2011, p. 1022) further commented on the misinterpretation of lean developments, reasserting his concerns from 1991:

How to proceed was outlined 1991…"The key is not to adopt the methods and the systems but to understand their foundations. The next step is to assess which parts can be adopted or adjusted to the circumstances at hand and, most importantly, what could be improved."

A problem exists when lean is misunderstood to be a set of tools alone or the tools are adopted in part in the name of a lean implementation. The true benefit of lean is seen when a deeper thinking is applied in order to ensure that value is understood and flows with as little wasteful actions as possible when the customers pulls it from the system (Womack & Jones, 1996, 2003). Moreover, this thinking should pervade the whole organisation. Unfortunately, to see, apply, and sustain this is not always straight-forward. A process of implementing piecemeal tools and techniques is a lot simpler to apprehend. For instance, it is easy to understand that the housecleaning and organising type of work achieved with the 5S system will benefit a company. It is also relatively easy to plan for and execute such an implementation, and any typical mass production organisation would likely benefit from such implementation (Hines et al., 2008). However, it requires another level of

thinking to define value from the customer's perspective and uncover how to flow value to the customer. It is even further difficult to achieve and sustain the internal culture of strategy, leadership, employee behaviour, and employee engagement needed to have an embedded culture of lean continuous improvement at all levels. This is confirmed by many (Balle, 2011; Bhasin, 2015; Boyle et al., 2011; Crute et al., 2003; Hallam et al., 2010; Hines et al., 2008; Liker, 2004; Pont, Furlan, & Vinelli, 2009; Womack & Jones, 2003; Womack et al., 1990).

To summarise, the relative ease to implement and understand the tools over the higher level strategic and cultural thinking has influenced the approach to lean implementations. While the typical tool focused approach provides initial benefits, sustainability may be more elusive, and there is a resultant high failure rate of lean implementations.

3.6 Existing Frameworks for Lean Change

There are existent models of lean implementation but few sufficiently focus on lean success and sustainability (permanency). Lean has this in common also with the change literature. Various sustainability models have been reviewed (Goodyer et al., 2011; Jasti & Kodali, 2015). Of the models, many come from or at least are accounted for in Cardiff Universities Lean Enterprise Research Centre (LERC) research which culminated in the frameworks of Staying Lean (Hines, 2010; Hines et al., 2008; 2011).

A prominent framework is the Liker (2004; 2011) 4P model. The 4Ps are philosophy, process, people and partners, and problem solving. These are expounded into 14 principles that make up the majority of the popular text "The Toyota Way" (Liker, 2004). *The Toyota Way* emphasises the culture, the processes, and leaders that are needed to develop a learning organisation. The lean iceberg model (Hines, 2010; Hines et al., 2011) is a graphic representation of the underpinning causality of successful implementation. Liker (2004) included a similar but less specific iceberg model in The Toyota Way (p. 298). In the Iceberg Model, the visible aspects are those above the waterline and the invisible aspects are those below the waterline. Above the waterline are the technology tools & techniques, and processes. These are relatively easy to visualise, understand and implement. The submerged underpinning principles are strategy, alignment to strategy, leadership, employee behaviour, and employee engagement.

Frameworks for implementation in lean SMEs have also been developed (see Rose, Deros, & Rahman, 2010; Rose, Deros, Rahman, & Nordin, 2011; Thomas, Barton, & Chuke-Okafor, 2008). These frameworks tend toward lean as a project, rather than developing organisational culture for excellence, and hence have a tools focus, e.g. what tools to implement first. Their emphasis on sustainability is weaker. They also tend towards reliance on external support and consultants. Similarly Stamm (2011) proposed a framework that emphasised a lean expert approach to gaining knowledge.

3.7 Gaps in the Body of Knowledge

Traditional directive models of change are largely *management-centric* and do not reliably result in in sustained change (Burnes, 2005). From the early stages of change research sustainability, the permanency of a change, was identified as a key issue (Lewin, 1947) and continues to be (e.g. Buchanan et al., 2005; Heath & Heath, 2010; Kotter, 1995). The issue is that the increase in performance may be short-lived, and require ongoing managerial effort to sustain. The gap between the science and practice of organisational change has been said to be the "single biggest impediment in effective change management" (Pettigrew et al., 2001, p. 700). This has serious implications for the change process of implementing lean.

Organisational learning has been integrated with the lean literature to some extent (Fynes & Ainamo, 1998; Lantelme & Formoso, 2000; Lewis, 2000; MacDuffie & Helper, 1997; Morgan & Liker, 2006). There is a need to further reconceptualise lean implementation from the view of organisational development.

4. Outcomes

4.1 People Dimension to Lean

Lean is commonly viewed as a technocratic solution for maximising value with the elimination of waste but Ohno considered the *respect for humans* principle equally important (Ohno, 1988). Minimising waste should not be the sole target. Waste reduction should be considered as the result and engaging and empowering people are the means to reach the goal. Engagement and empowerment of employees can be considered more important, rendering longer lasting results (Hines et al., 2008, p. 7). As Schmidt (2011, p. 1023) comments:

Minimizing waste should be the result not the goal. It is more important to empower all employees to contribute to the accumulation of knowledge… otherwise… knowledge will be neglected in favour of focusing all efforts on the avoidance of waste.

This discussion by Schmidt (2011) points out that there are below the surface factors critical to the success of a lean implementation. These factors are not as tangible as lean tools but are critical. Having these factors, e.g. employee engagement and empowerment through the proper guidance and training by committed managers (Balle & Balle, 2009, p. vii; Boyle et al., 2011; Worley & Doolen, 2006), can issue in a culture-excellent learning organisation (Hines et al., 2008; Liker, 2004). Therefore, practitioners are encouraged to avoid being fixated on the methods; there is a philosophy, and there are tools, but they must be appropriately applied together (Liker, 2004, p. 111).
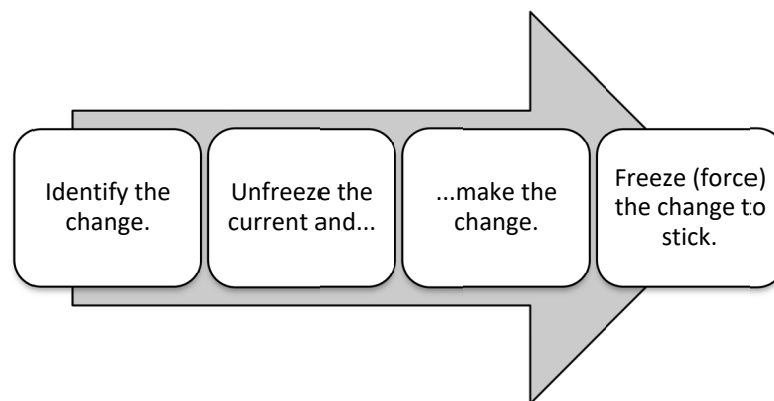
4.2 The Lean and Learning Organisation—A Model

Figure 1. The planned change management model (Lewin, 1947)

The change is identified by top management then driven to the workers. Thereafter management freeze the change.

Figure 1 shows the classic planned change management model established by Lewin (1947). However, the planned change method has limitations when applied to lean, because it is reliant on the insight and vigilance of senior management. It is not possible for these managers to have the level of operational insight that workers have, hence the planned change approach risks missing key opportunities. Furthermore planned change is incongruent with quality systems which devolve quality decisions to operator level. Modern organisations are collaborations between management and workers, and complex change initiatives like lean require a change to organisational culture that cannot be achieved in a sustainable way by management sanction alone.
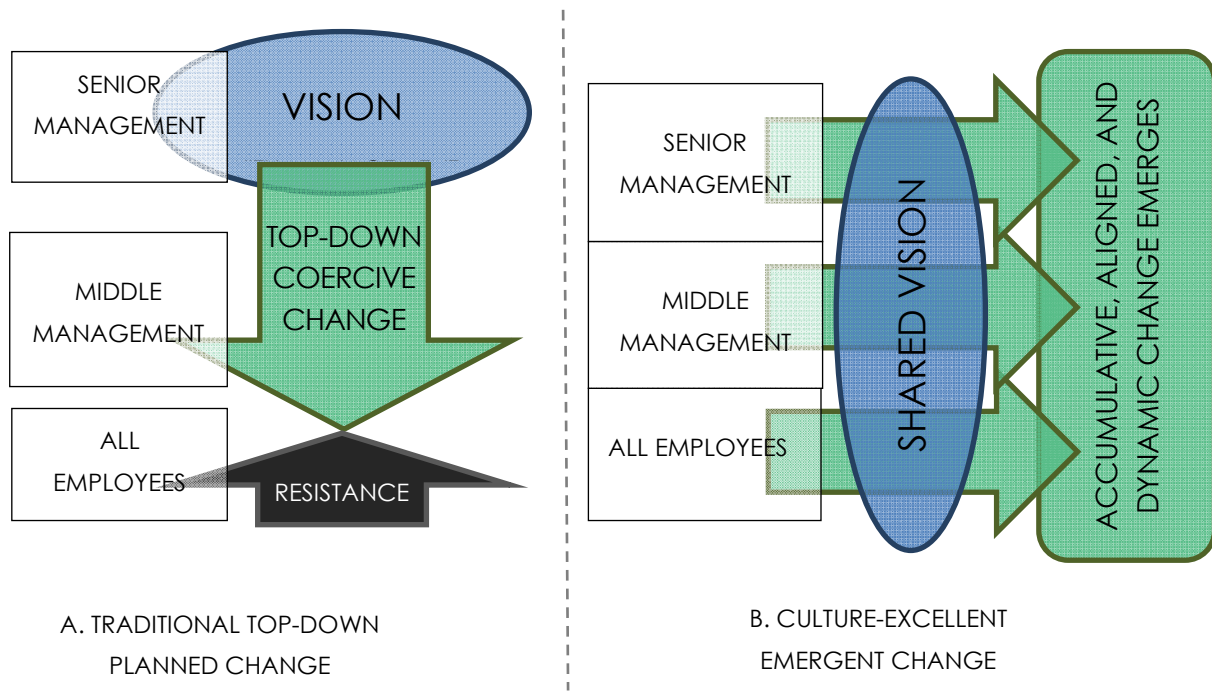
Figure 2. Traditional Top-Down Change compared with Culture-Excellent Emergent Change

We propose the model of planned and continuous change as shown in Figure 2. The model shows the relationship between organisation structure (hierarchy), the vision of the organisation and its internal mechanisms for change. At one end of the spectrum of change is a coercive top-down planned approach from management. At the other end is a culture-excellent emergent change approach, where change emerges from all levels.

Arguably change should be viewed as something that is occurring continuously and endogenously emerging. However many take a top-down planned approach as shown on the left hand side of Figure 2. This approach is where senior management hold the vision and drive the change that they see fit to the organisation. They typically use coercion to overcome resistance to change from employees at other levels. This may be suitable for slowly changing organisations where stability is paramount but does not meet the need for agility in the modern marketplace.

The preferred approach is the culture excellent-emergent change model as depicted on the right hand side of Figure 2. This shows a vision that has been shared with all staff, that sets basic rules of operation, and aligns staff initiatives to the goals of the organisation. In this model, management values the contribution of all employees to the development of the company. The result is accumulated aligned change emerging at all levels, rather than a top-down change resisted by the lower levels and requiring coercive treatment. An initial implementation of lean is typically top-down, lead from a management level. Management typically makes a decision to do something about performance. However, the ideal future state is when details of the change are led by knowledgeable operators who commit their agency to perpetually improve the organisation. That is, lean's respect for humans principle suggests that the factory floor, the "gemba" or   (place of work), is where change should be driven from (Ohno, 1988).

These changes should still be aligned with the strategic objectives and direction from management (Hines et al., 2008; 2010). It is recognised that some major changes, like strategic manufacturing decisions, are more likely to be initiated from a higher level in the organisation, for example changing a facility from operating as batch and queue to operating with one-piece flow just-in-time would occur from higher up. Hence, true lean implementation is a change that is planned from the top-down with the goal of producing continuous emergent change from all levels.

5. Discussion

5.1 Outcomes

What our model proposes is that a critical success factor for implementing lean is Culture-Excellent Emergent

Change. This is about leaders developing a shared vision across the whole organisation, rather than immediately focusing on implementation of tools.

5.2 Implications for Practitioners

A planned change intervention can be used to overcome existing inertia (Weick & Quinn, 1999). In this way a planned change can be used to open up possibilities for on-going improvements, some which are anticipated and some which are not (Tsoukas & Chia, 2002). The unanticipated changes are the results of enabling emergent change. This was seen in the Navy's introduction of total quality management (TQM), through which the suggestions from junior officers were finally recognised (Tsoukas & Chia, 2002; ref. Barrett, Thomas, & Hocevar, 1995). This was a planned change for TQM that facilitated emergent change. In this work, preference is given to "emergent" change rather than "bottom-up" change. This is to clarify the difference between bottom-up and emergent. Traditional top-down approaches have limited effectiveness and bottom-up change is considered powerful. However, leadership is still necessary; at times, change should be initiated from the top levels. This is particularly due to a strategic overview and company direction possessed by senior management. Thus, *emergent* is used as an inclusive term that represents change coming from all levels, not top-down, not-bottom up but from all levels.

5.3 Limitations and Opportunities for Future Research

This was a substantial review of the key established literature in both fields with the goal of merging key concepts. Further work is needed to develop models that are more detailed and understanding of this transitioning change and the contingent factors of success and failure.

6. Conclusion

This paper provides new insights into lean implementation (transformation) by framing lean transformation clearly within the organisational development literature. Lean implementation can be characterised as a transformational change that begins with a top-down episodic change initiative. However, the goal is to develop a learning organisation where change is continuous and emergent from all levels. This interpretation is in line with the respect for humans principle of lean and in keeping with the kaizen philosophy.

Practitioners will benefit from recognising that the transition from planned to emergent change is the goal of a lean implementation. There is still the need to plan and initiate change and the methods of lean should not be neglected, but introduced in a way that fosters change from within. This is to acknowledge that the goal is not an isolated improvement but the development of a learning organisation.

References

Ackerman, L. S. (1986). Change management: Basics for training. *Training & Development Journal*.

Ackoff, R. L. (1972). A note on systems science. *Interfaces*, *2*(4), 40-41. https://doi.org/10.1287/inte.2.4.40

Ackoff, R. L. (1981). The art and science of mess management. *Interfaces*, 20-26. https://doi.org/10.1287/inte.11.1.20

Ackoff, R. L. (2003). What's wrong with "what's wrong with." *Interfaces*, *33*(5), 78-82. https://doi.org/10.1287/inte.33.5.78.19242

Anderson, D., & Ackerman-Anderson, L. (2010). *Beyond change management: How to achieve breakthrough results through conscious change leadership*. John Wiley & Sons.

Anderson, D., & Ackerman-Anderson, L. S. (2001). *Beyond change management: Advanced strategies for today's transformational leaders*. John Wiley & Sons.

Argyris, C. (1977). Double loop learning in organizations. *Harvard Business Review*, *55*(5), 115-125.

Arlbjørn, J. S., & Freytag, P. V. (2013). Evidence of lean: A review of international peer‐reviewed journal articles. *European Business Review*, *25*(2), 174-205. https://doi.org/10.1108/09555341311302675

Armenakis, A. A., & Bedeian, A. G. (1999). Organizational change: A review of theory and research in the 1990s. *Journal of Management*, *25*(3), 293-315. https://doi.org/10.1177/014920639902500303

Bakkalbasi, N., Bauer, K., Glover, J., & Wang, L. (2006). Three options for citation tracking: Google Scholar, Scopus and Web of Science. *Biomedical Digital Libraries*, *3*(1), 7. https://doi.org/10.1186/1742-5581-3-7

Balle, M. (2011, August 23). Takt time thinking for a low-volume high-mix company. Retrieved August 28, 2011, from http://www.lean.org/balle/

Balle, M., & Balle, F. (2009). *The lean manager: A novel of lean transformation* (1st ed.). Lean Enterprise Institute, Inc.

Barrett, F. J., Thomas, G. F., & Hocevar, S. P. (1995). The central role of discourse in large-scale change: A social construction perspective. *The Journal of Applied Behavioral Science*, *31*(3), 352-372. https://doi.org/10.1177/0021886395313007

Bateman, N., Hines, P., & Davidson, P. (2014). Wider applications for Lean: An examination of the fundamental principles within public sector organisations. *International Journal of Productivity and Performance Management*, *63*(5), 550–568. https://doi.org/10.1108/IJPPM-04-2013-0067

Becker, M. C. (2004). Organizational routines: a review of the literature. *Industrial and Corporate Change*, *13*(4), 643-678. https://doi.org/10.1093/icc/dth026

Bhasin, S. (2011). Performance of organisations treating lean as an ideology. *Business Process Management Journal*, *17*(6), 986–1011. https://doi.org/10.1108/14637151111182729

Bhasin, S. (2015). *Lean management beyond manufacturing*. Cham: Springer International Publishing. Retrieved from http://link.springer.com/10.1007/978-3-319-17410-5

Bordia, P., Restubog, S. L. D., Jimmieson, N. L., & Irmer, B. E. (2011). Haunted by the Past: Effects of Poor Change Management History on Employee Attitudes and Turnover. *Group & Organization Management*, *36*(2), 191-222. https://doi.org/10.1177/1059601110392990

Boyle, T. A., Scherrer-Rathje, M., & Stuart, I. (2011). Learning to be lean: the influence of external information sources in lean improvements. *Journal of Manufacturing Technology Management*, *22*(Copyright 2011, The Institution of Engineering and Technology), 587–603.

Buchanan, D., Fitzgerald, L., Ketley, D., Gollop, R., Jones, J. L., Lamont, S. S., … Whitby, E. (2005). No going back: A review of the literature on sustaining organizational change. *International Journal of Management Reviews*, *7*(3), 189-205. https://doi.org/10.1111/j.1468-2370.2005.00111.x

Burnes, B. (2005). Complexity theories and organizational change. *International Journal of Management Reviews*, *7*(2), 73-90. https://doi.org/10.1111/j.1468-2370.2005.00107.x

Caldwell, R. (2012). Leadership and Learning: A Critical Reexamination of Senge's Learning Organization. *Systemic Practice and Action Research*, *25*(1), 39-55. https://doi.org/10.1007/s11213-011-9201-0

Cameron, E., & Green, M. (2015). *Making Sense of Change Management: A Complete Guide to the Models, Tools and Techniques of Organizational Change*. Kogan Page Publishers.

Cooney, R. (2002). Is "lean" a universal production system?: Batch production in the automotive industry. *International Journal of Operations & Production Management*, *22*(10), 1130-1147. https://doi.org/10.1108/01443570210446342

Crute, V., Ward, Y., Brown, S., & Graves, A. (2003). Implementing Lean in aerospace - Challenging the assumptions and understanding the challenges. *Technovation*, *23*(12), 917-928. https://doi.org/10.1016/S0166-4972(03)00081-6

Dahlgaard, J. J., & Dahlgaard-Park, S. M. (2006). Lean production, six sigma quality, TQM and company culture. *The TQM Magazine*, *18*(3), 263–281. https://doi.org/10.1108/09544780610659998

Emiliani, M. L. (2006). Origins of lean management in America: The role of Connecticut businesses. *Journal of Management History*, *12*, 167–184. https://doi.org/10.1108/13552520610654069

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *The FASEB Journal*, *22*(2), 338-342. https://doi.org/10.1096/fj.07-9492LSF

Fynes, B., & Ainamo, A. (1998). Organisational learning and lean supply relationships: the case of Apple Ireland. *Supply Chain Management: An International Journal*, *3*(2), 96-107. https://doi.org/10.1108/13598549810215414

Gino, F., & Staats, B. (2015). Why Organizations Don't Learn. *Harvard Business Review*, *93*(November), 110-118.

Goodyer, J., Murti, Y., Grigg, N. P., & Shekar, A. (2011). Lean: insights into SMEs ability to sustain improvement. Presented at the 18th International Annual EurOMA Conference, Cambridge, United Kingdom: University of Cambridge.

Hadid, W., & Mansouri, S. A. (2014). The lean-performance relationship in services: a theoretical model. *International Journal of Operations & Production Management*, *34*(6), 750–785. https://doi.org/10.1108/IJOPM-02-2013-0080

Hallam, C. R. A., Muesel, J., & Flannery, W. (2010). Analysis of the Toyota Production System and the genesis of six sigma programs: An imperative for understanding failures in technology management culture transformation in traditional manufacturing companies (pp. 1835–1845). Phuket, Thailand: IEEE Computer Society.

Hallgren, M., & Olhager, J. (2009). Lean and agile manufacturing: external and internal drivers and performance outcomes. *International Journal of Operations & Production Management*, *29*(Copyright 2010, The Institution of Engineering and Technology), 976–99. https://doi.org/10.1108/01443570910993456

Heath, C., & Heath, D. (2010). *Switch: How to change things when change is hard* (1st ed.). Crown Business.

Hendry, C. (1996). Understanding and creating whole organizational change through learning theory. *Human Relations*, *49*(5), 621-641. https://doi.org/10.1177/001872679604900505

Hines, P. (2010). How to create and sustain a lean culture. *Development and Learning in Organizations: An International Journal*, *24*(6). https://doi.org/10.1108/dlo.2010.08124fad.007

Hines, P., Found, P., Griffiths, G., & Harrison, R. (2008). *Staying lean: Thriving, not just surviving*. Lean Enterprise Research Centre.

Hines, P., Found, P., Griffiths, G., & Harrison, R. (2011). *Staying lean: Thriving, not just surviving* (2nd ed.). Productivity Press. Retrieved from https://doi.org/10.1201/b10492

Hines, P., Holweg, M., & Rich, N. (2004). Learning to evolve: a review of contemporary lean thinking. *International Journal of Operations & Production Management*, *24*(Copyright 2005, IEE), 994-1011. https://doi.org/10.1108/01443570410558049

Imai, M. (1986). *Kaizen: The key to Japan's competitive success* (1st ed.). McGraw-Hill/Irwin.

Jasti, N. V. K., & Kodali, R. (2015). A critical review of lean supply chain management frameworks: proposed framework. *Production Planning & Control*, *0*(0), 1-18. https://doi.org/10.1080/09537287.2015.1004563

Johnstone, C., Pairaudeau, G., & Pettersson, J. A. (2011). Creativity, innovation and lean sigma: a controversial combination? *Drug Discovery Today*, *16*(1-2), 50-57. https://doi.org/10.1016/j.drudis.2010.11.005

Judson, A. S. (1991). *Changing behavior in organizations: minimizing resistance to change* (Rev Sub). Blackwell Pub.

Jusko, J. (2012, February 14). Demand Surges for Lean Talent over Six Sigma. Retrieved January 4, 2013, from http://www.industryweek.com/companies-amp-executives/demand-surges-lean-talent-over-six-sigma

Kanter, R. M., Stein, B., & Jick, T. (1992). *The Challenge of organizational change: how companies experience it and leaders guide it*. Free Press.

Kotter, J. P. (1995). Leading change: Why transformation efforts fail. *Harvard Business Review*, *73*, 59-59.

Kotter, J. P. (1998). Winning at change. *Leader to Leader*, *10*, 27-33. https://doi.org/10.1002/ltl.40619981009

Kotter, J. P. (2006). Transformation: master three key tasks. *Leadership Excellence*, *23*(1), 14.

Kotter, J. P., & Rathgeber, H. (2006). Our iceberg is melting. *Leadership Excellence*, *23*(2), 11.

Kuipers, B. S., Higgs, M., Kickert, W., Tummers, L., Grandia, J., & Van Der Voet, J. (2014). The management of change in public organizations: A literature review. *Public Administration*, *92*(1), 1-20. https://doi.org/10.1111/padm.12040

Lander, E., & Liker, J. K. (2007). The Toyota Production System and art: making highly customized and creative products the Toyota way. *International Journal of Production Research*, *45*(16), 3681-3698. https://doi.org/10.1080/00207540701223519

Lantelme, E., & Formoso, C. T. (2000). Improving performance through measurement: the application of lean production and organisational learning principles. In *Eight Annual conference of the International Group for Lean Construction*.

Lee, G., Bennett, D., & Oakes, I. (2000). Technological and organisational change in small-to medium-sized manufacturing companies: a learning organisation perspective. *International Journal of Operations & Production Management*, *20*(5), 549-572. https://doi.org/10.1108/01443570010318922

Lewin, K. (1947). Frontiers in group dynamics concept, method and reality in social science; social equilibria and social change. *Human Relations*, *1*(1), 5-41. https://doi.org/10.1177/001872674700100103

Lewis, M. A. (2000). Lean production and sustainable competitive advantage. *International Journal of Operations & Production Management*, *20*(8), 959-978. https://doi.org/10.1108/01443570010332971

Liker, J. (2004). *The Toyota Way* (1st ed.). McGraw-Hill.

Liker, J., & Franz, J. K. (2011). *The Toyota Way to continuous improvement: Linking strategy and operational excellence to achieve superior performance* (1st ed.). McGraw-Hill.

MacDuffie, J. P., & Helper, S. (1997). Creating lean suppliers: Diffusing lean production through the supply chain. *California Management Review*, *39*(4). https://doi.org/10.2307/41165913

Macrì, D. M., Tagliaventi, M. R., & Bertolotti, F. (2002). A grounded theory for resistance to change in a small organization. *Journal of Organizational Change Management*, *15*(3), 292-310. https://doi.org/10.1108/09534810210429327

McDermott, C. M., & Venditti, F. J. (2015). Implementing lean in knowledge work: Implications from a study of the hospital discharge planning process. *Operations Management Research*, *8*(3-4), 118-130. https://doi.org/10.1007/s12063-015-0103-7

Morgan, J., & Liker, J. (2006). The Toyota product development system. *Integrating People, Process, and Technology. Charlotte, NC: B&T*.

Murray, P., & Chapman, R. (2003). From continuous improvement to organisational learning: developmental theory. *Learning Organization, The*, *10*(5), 272-282. https://doi.org/10.1108/09696470310486629

O'Keeffe, T. (2002). Organisational learning: a new perspective. *Journal of European Industrial Training*, *26*(2/3/4), 130-141. https://doi.org/10.1108/03090590210422012

Ohno, T. (1988). *Toyota production system: beyond large-scale production* (1St Edition). Productivity Press.

Oreg, S., Vakola, M., & Armenakis, A. (2011). Change recipients' reactions to organizational change a 60-year review of quantitative studies. *The Journal of Applied Behavioral Science*, *47*(4), 461-524. https://doi.org/10.1177/0021886310396550

Orton, J. D., & Weick, K. E. (1990). Loosely coupled systems: A reconceptualization. *Academy of Management Review*, 203-223.

Pedler, M., Boydell, T., & Burgoyne, J. (1989). Towards the learning company. *Management Education and Development*, *20*(Part 1), 7989.

Pettigrew, A. M., Woodman, R. W., & Cameron, K. S. (2001). Studying organizational change and development: Challenges for future research. *The Academy of Management Journal*, *44*(4), 697-713. https://doi.org/10.2307/3069411

Plowman, D. A., Solansky, S., Beck, T. E., Baker, L., Kulkarni, M., & Travis, D. V. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, *18*(4), 341-356. https://doi.org/10.1016/j.leaqua.2007.04.004

Pont, G. D., Furlan, A., & Vinelli, A. (2009). Interrelationships among lean bundles and their effects on operational performance. *Operations Management Research*, *1*(2), 150-158. https://doi.org/10.1007/s12063-008-0010-2

Porter, M. E. (2006). What Is Strategy? *Harvard Business Review*.

Radnor, Z., & Johnston, R. (2013). Lean in UK Government: internal efficiency or customer service? *Production Planning & Control*, *24*(10-11), 903-915. https://doi.org/10.1080/09537287.2012.666899

Radnor, Z., Holweg, M., & Waring, J. (2012). Lean in healthcare: The unfilled promise? *Social Science & Medicine*, *74*(3), 364-371. https://doi.org/10.1016/j.socscimed.2011.02.011

Ricondo, I., & Viles, E. (2005). Six Sigma and its link to TQM, BPR, lean and the learning organisation. *International Journal of Six Sigma and Competitive Advantage*, *1*(3), 323-354. https://doi.org/10.1504/IJSSCA.2005.008095

Rivera, L., & Frank Chen, F. (2007). Measuring the impact of Lean tools on the cost-time investment of a product using cost-time profiles. *Robot. Comput.-Integr. Manuf.*, *23*(6), 684-689. https://doi.org/10.1016/j.rcim.2007.02.013

Rose, A. M. N., Deros, B. M., & Rahman, M. N. A. (2010). Development of framework for lean manufacturing implementation in SMEs.

Rose, A. M. N., Deros, B. M., Rahman, M. N. A., & Nordin, N. (2011). Lean manufacturing best practices in SMEs. In *Proceedings of the (2011) international conference on industrial engineering and operations management* (pp. 22-24).

Sashkin, M., & Burke, W. W. (1987). Organization Development in the 1980's. *Journal of Management*, *13*(2), 393-417. https://doi.org/10.1177/014920638701300212

Schmidt, S. (2011). From hype to ignorance-a review of 30 years of lean production. *Proceedings of World Academy of Science, Engineering and Technology*, *73*, 1021-1024.

Selko, A. (2012, February 23). Strategies to help manufacturers compete successfully. Retrieved from http://www.industryweek.com/companies-amp-executives/strategies-help-manufacturers-compete-successfully

Senge, P. M. (1990). *The fifth discipline: the art and practice of the learning organization*. Doubleday/Currency.

Sertyesilisik, B. (2014). Lean and Agile Construction Project Management: As a Way of Reducing Environmental Footprint of the Construction Industry. In H. Xu & X. Wang (Eds.), *Optimization and Control Methods in Industrial Engineering and Construction* (pp. 179-196). Springer Netherlands. Retrieved from https://doi.org/10.1007/978-94-017-8044-5_11

Shah, R., & Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of Operations Management*, *25*(4), 785–805. https://doi.org/10.1016/j.jom.2007.01.019

Shin, D., Kalinowski, J. G., & Abou El-Enein, G. (1998). Critical implementation issues in total quality management. *SAM Advanced Management Journal*, *63*, 10-14.

Shingo, S. (1989). *A study of the Toyota production system: From an industrial engineering viewpoint* (Rev Sub). Productivity Press.

Sousa, R., & Voss, C. A. (2008). Contingency research in operations management practices. *Journal of Operations Management*, *26*(6), 697-713. https://doi.org/10.1016/j.jom.2008.06.001

Spence, J. (2012, February 23). Culture = cash. Retrieved February 23, 2012, from http://results.com/announcements/culture-cash

Stamm, M. (2011). *Framework for the integration of an advanced manufacturing paradigm and methodologies in New Zealand manufacture-to-order SMEs*.

Thomas, A., Barton, R., & Chuke-Okafor, C. (2008). Applying lean six sigma in a small engineering company – a model for change. *Journal of Manufacturing Technology Management*, *20*(1), 113–129. https://doi.org/10.1108/17410380910925433

Tommelein, I. (2015). Journey toward lean construction: pursuing a paradigm shift in the AEC industry. *Journal of Construction Engineering and Management*, *141*(6), 04015005. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000926

Tsang, E. W. (1997). Organizational learning and the learning organization: a dichotomy between descriptive and prescriptive research. *Human Relations*, *50*(1), 73–89. https://doi.org/10.1177/001872679705000104

Tsoukas, H., & Chia, R. (2002). On organizational becoming: Rethinking organizational change. *Organization Science*, 567–582. https://doi.org/10.1287/orsc.13.5.567.7810

Üsdiken, B., Kipping, M., & Engwall, L. (2011). Historical perspectives on organizational stability and change: Introduction to the special issue. *Management & Organizational History*, *6*(1), 3–12. https://doi.org/10.1177/1744935910387032

Vlachos, I. (2015). Applying lean thinking in the food supply chains: a case study. *Production Planning & Control*, *26*(16), 1351–1367. https://doi.org/10.1080/09537287.2015.1049238

Weick, K. E., & Quinn, R. E. (1999). Organizational change and development. *Annual Review of Psychology*, *50*(1), 361–386. https://doi.org/10.1146/annurev.psych.50.1.361

Womack, J. P. (2007). Moving beyond the tool age [lean management]. *Manufacturing Engineer*, *86*, 4–5. https://doi.org/10.1049/me:20070101

Womack, J. P., & Jones, D. T. (1996). *Lean thinking, banish waste and create wealth in your corporation* (1st ed.). Productivity Press.

Womack, J. P., & Jones, D. T. (2003). *Lean thinking: banish waste and create wealth in your corporation, revised and updated* (2nd ed.). Free Press.

Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world*. Scribner.

Worley, J. M., & Doolen, T. L. (2006). The role of communication and management support in a lean manufacturing implementation. *Management Decision*, *44*(2), 228–245. https://doi.org/10.1108/00251740610650210

Note

Note 1. Force Field Analysis brings social science closer to physical science by analysing the factors or "forces" that influence a situation e.g. on a person in the process of change.