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Title: Lean in Healthcare: The Unfilled Promise?

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Abstract

In an effort to improve operational efficiency, healthcare services around the world have adopted process improvement methodologies from the manufacturing sector, such as Lean Production. In this paper we report on four multi-level case studies of the implementation of Lean in the English NHS. Our results show that this generally involves the application of specific Lean 'tools', such as 'kaizen blitz' and 'rapid improvement events', which tend to produce small-scale and localised productivity gains. Although this suggests that Lean might not currently deliver the efficiency improvements desired in policy, the evolution of Lean in the manufacturing sector also reveals this initial focus on the 'tool level'. In moving to a more system-wide approach, however, we identify significant contextual differences between healthcare and manufacturing that result in two critical breaches of the assumptions behind Lean. First, the customer and commissioner in the private sector are the one and the same, which is essential in determining 'customer value' that drives process improvement activities. Second, healthcare is predominantly designed to be capacity-led, and hence there is limited ability to influence demand or make full use of freed up resources. What is different about this research is that these breaches can be regarded as not being primarily 'professional' in origin but actually more 'organisational' and 'managerial' and, if not addressed could severely constrain Lean's impact on healthcare productivity at the systems level.

Introduction

There is a growing pressure on public services around the world to increase their efficiency by adopting concepts and methodologies more commonly associated with private enterprise and manufacturing. A recent review on the use of such methodologies in the public sector revealed that 51% of publications focused on Lean, a further 13% on Business Process Reengineering, with 35% stating their use in health services (Radnor, 2010). In short, Lean

seeks to reconfigure organisational processes to reduce waste and enhance productivity based upon the application of specialist analytical tools and techniques coupled with creating a culture of continuous improvement (Womack and Jones 1996). Lean projects in healthcare have become widespread: Brandao de Souza (2009) show that most have occurred in the USA (57%), with the UK growing at a fast pace (29%), followed by Australia at 4%. Cases such as the Virginia Mason Medical Center in Seattle (USA), Flinders in Australia and the Royal Bolton NHS Foundation Trust in the UK have become celebrated examples of Lean implementation in healthcare settings. In these and other cases there is growing evidence of the potential impact on quality, cost and time, and satisfaction of both staff and customers. Many of the results reported have been in terms of tangible outputs such as reduction in waiting times, increases in quality through a reduction of errors, reduction in costs, as well as intangibles ones such as increased employee motivation and increased customer satisfaction (Radnor & Boaden, 2008).

It is worth considering, however, that this 'efficiency agenda' is not new and that since 1970s and 80s various attempts have been made across the world to contain healthcare spending and improve service performance, including major structural reforms in commissioning (Ham, 1997). One of the most prominent and widely debated developments has been the expansion of management practices in the organisation of clinical services (Alford, 1975). Reflecting the ethos of New Public Management (Hood, 1991), the managerialisation of healthcare is widely based upon the introduction of '*private sector personnel, models and techniques'* (Pettigrew et al., 1992). This translation of private sector management practices into healthcare has been described by many commentators as representing challenging, even countervailing powers to established healthcare professionals (Alford, 1975). In the UK National Health Service (NHS) for instance, a multitude of specialist management domains have been introduced to transform established organisational and professional working practices regarded as wasteful, unproductive or unsafe. This includes performance management (Scrivens, 1988), Business Process Engineering (BPR) (McNulty & Ferlie, 2002), quality assurance (Pollitt, 1993), risk management (Waring, 2005) and knowledge management (Currie et al., 2008). It is within this context that the recent introduction of Lean Healthcare can be seen as a further attempt to reorganise and rationalise healthcare services through the translation of management practices found within the commercial sector (Waring & Bishop, 2010). It is worth noting, that in many of these instances the impact on organisational performance, and indeed professional practice, has often been less than anticipated. Research attests to the persistence of deeply institutionalised forces that complicate and constrain reform (Currie & Suhomlinova, 2006; Pettigrew et al., 1992). This includes competing or contradictory political, regulatory or commissioning priorities; the persistence of powerful professional

groups as manifest in specialist expertise, established ways of working, and defined jurisdictional boundaries; and high degrees of organisational complexity between both clinical specialities and service sectors that make the management of change difficult and contingent.

This marks the starting point of our paper, asking to what degree Lean has been successfully transferred into healthcare. We report on four multi-level longitudinal case studies within one region of the English NHS (three Hospital Trusts and one Mental Health Trust), where we essentially assessed what works, what did not, and why. We compare our findings to the general evolution of Lean in private organisations in order to draw out the differences related to the respective contexts over time, and to assess the validity of Lean as context-free improvement methodology.

Lean Thinking

Originating from the Toyota Motor Corporation, Lean (also referred to as the Toyota Production System, TPS) is considered to be a radical alternative to the traditional method of mass production and batching principles for maximising operational efficiency, quality, speed and cost (Holweg, 2007). The development of Lean Production has been widely discussed, and shall not be recounted here (Fujimoto, 1999; Hines et al., 2004; Holweg, 2007; Ohno, 1988; Womack et al., 1990). Instead we briefly define Lean and its underlying assumptions, before discussing its applications in healthcare.

Definition and Key Assumptions of Lean

Although conceptually simple, it is not easy to define 'Lean'. The core philosophy is to continually improve a process by removing non-value added steps or 'waste' (Japanese: 'muda'). The initial wastes were defined by Taiichi Ohno for a manufacturing environment and have been adapted for the healthcare context, for example by the NHS Institute for Improvement and Innovation (NHSIII, (2007)), as shown in Table 1. Another way of defining Lean is through the five 'Lean principles' (Womack & Jones, 1996), as outlined in Table 2. These are based on an underlying assumption that organisations are made up of processes, and through engaging with these five principles in a step-wise and sequential way organisations can work to add value, reduce waste and continuously improve ("kaizen") in an ever-repeating process.

Table 1 & 2 about here

The focus on waste alone restricts the scope of Lean given that ‘muda’ (waste) is only one of three interrelated concepts: ‘mura’ relates to ‘unevenness’, and argues for stable demand that results in less variation and more efficient and standardised processes; ‘muri’ relates to ‘excessive strain’, and argues for good working conditions that prevent injuries and strain on the worker which is a clear factor in reducing absenteeism. Thus, putting the elements together, we define:

> *‘Lean as a management practice based on the philosophy of continuously improving processes by either increasing customer value or reducing non-value adding activities (muda), process variation (mura), and poor work conditions (muri).’*

We distinguish three aspects of the Lean activities: assessment, improvement, and performance monitoring. Assessment activities which include reviewing the performance of existing organisational processes in terms of their waste, flow or capacity to add value, such as “waste walks” or more formal process/value stream mapping exercises. Improvement activities to support and improve processes, e.g. Rapid Improvement Events (RIEs, also referred to as “kaizen blitz” or “kaikaku” events) which are held over 3 to 5 days and involve staff evaluating, developing and redesigning processes through forms of problem solving or housekeeping tools, such as “5S” (which comprises of *Sorting*, *Setting in Order*, *Sweeping*, *Standardising* and *Sustaining*). Finally, monitoring to measure the processes and any improvements made, which include visual management tools that feature highly visible information on process flows, standard operating procedures (SOPs), and performance data.

In order to assess the overall impact of Lean, it is important to clarify its underlying assumptions:

1. It is possible to determine ‘value’ and ‘waste’ from a customer's point of view, so that wasteful activities in the process can be defined;
2. There is a defined and measurable benefit to the organisation in reducing non-value adding activities, such as a reduction in costs or an increased competiveness;
3. Freeing up resources helps the business grow.

We return to these in the course of our assessment of current Lean healthcare implementations; in the following will first review the existing cases of Lean implementations in healthcare.

Lean in Healthcare

Lean has been embraced across public services, including healthcare, central government and local government organisations (Radnor, 2010). The application of Lean principles in healthcare, particularly hospitals, should remove duplicate processes and unnecessary procedures such as: recording patient details in multiple places; excessive waiting for staff; and uncoordinated, variable discharge processes resulting in a longer length of stay (NHSIII, 2007).

From a historical perspective Lean first appeared in UK health service in 2001 and, in the USA in 2002. However, the literature suggests considerable variability in the implementation of Lean with differences in approach and scope. Specifically, the majority of healthcare providers tend towards small enclosed projects that create 'pockets of best practice' rather than adopting an organisation or system-wide approach (Brandao de Souza, 2009; Radnor, 2010). Royal Bolton NHS Foundation Trust is cited as the closest to a complete application of Lean in the UK (Radnor, 2010), although Spear (2005) asserts that *'[..] in healthcare, no organization has fully institutionalized to Toyota's level the ability to design work as experiments, improve work through experiments, share the resulting knowledge through collaborative experimentation and develop people as experimentalists' (pg 91).*

The Institute for Innovation and Improvement's 'Productive Series' is the most prominent example of Lean within the NHS. This initiative presents a systematic way of making improvements in various hospital settings, including wards, theatres and community services, mainly through the application of the 5S approach. Table 3 illustrates some other examples of the implementation of Lean in health, indicating various approaches and tools that have been used. It also illustrates some typical tangible and intangible benefits of the Lean implementation.

Table 3 about here

Such variations call for more attention to the ways Lean is translated and implemented. Healthcare is a highly political and complex organisational setting characterised by powerful professional groups and regulatory systems; which complicate the transfer and application of management techniques developed and successfully employed in other industries (McNulty & Ferlie, 2002; Pettigrew et al., 1992). Weiner (2004) suggests that management techniques for audit and quality assurance are often poorly suited to healthcare and can have the effect of redirecting clinical practice away from patient care towards more administrative tasks. Currie et al (2008) highlight how deeply embedded cultural norms and organisational

customs stymie attempts to introduce knowledge management systems, despite their successful application in other sectors. More broadly, reforms to promote more evidence-based and standardised clinical practice are also show to be inconsistent with the variability and ambiguity of clinical practice (McDonald et al., 2006). With specific reference to the introduction of Lean it has been suggested that efforts to streamline and rationalise clinical practices can be characterised as a new, but contested 'frontier' in the management of professional work (Waring & Bishop, 2010). Such research exemplifies how deeply embedded or institutionalised ways of working might limit the translation and implementation of Lean in the healthcare sector. There is a need therefore to understand how this current management trend is being implemented and to explain this variability in use.

Method

Our exploratory study looked further into how Lean is applied in healthcare organisations, and to determine the contextual factors that modulate implementation. A case study approach was taken to assess simultaneously the organisational dynamics of Lean at multiple levels and in multiple settings. Four public healthcare organisations within one English NHS region were identified that each had embarked on a Lean implementation in one or several parts of their organisation – either as part of their drive for efficiency or to gain Foundation Trust status (meaning that the Trust acquired devolved decision-making from central government). Table 4 gives an overview of the four case studies undertaken between September 2007 and May 2009 after agreement with the each of the Trusts' Chief Executive and ethics board.

Table 4 about here

All interviews were transcribed and additional 'reflective notes' were developed during the case study. The transcribed interviews were rigorously coded and classified using the six step procedure (Radnor, 2002). Radnor's technique for analysing and interpreting data follows six key steps, (1) topic ordering, (2) constructing categories, (3) reading for content, (4) completing coded sheets, (5) generating coded transcripts, and (6) analysis to interpretation. Radnor's (2002) data analysis approach is designed for the researcher to code whilst allowing the qualitative data to be linked, shaped and searched. Through using this method of analysis a level of sensitivity to detail and context can be enabled, as well as accurate access to information. This method of interpretation permits rigorous searching for patterns, building of theories or explanations and grounding them in data. Allowing the key

themes from the research study to emerge from the data to build a coherent understanding of how Lean is being implemented in Healthcare.

The material was written up as individual case study reports for each organisation which were then validated by senior management in each organisation. Interview schedules based around common thematic guides were developed for 'level' of staff in the organisation, i.e. senior grades, middle management and front line staff. Normally interviews with senior and middle management occurred individually, whereas focus groups with the 'front line' staff could consist of up to eight members.

It has been argued that methodologically, the majority of studies about Lean in healthcare are not comparative or rigorous in comparison with other research on management interventions (Lilford et al., 2003); instead isolated case studies focused on the tools are commonly used to promote its benefits without a view of the context and factors that determine its successful implementation (Laursen et al., 2003). To address this shortcoming, we assessed the Lean implementations using a framework comprising of four dimensions: (1) the definition of Lean, (2) the activities undertaken, (3) the organisational readiness, and (4), the sustainability of process improvements.

The first investigated the definition of Lean used in the organisation in order to assess the level of understanding and approach to implementation. Secondly, we considered the activities undertaken in order to understand what had been done under the 'Lean banner'. Thirdly, the organisational readiness was assessed in order to see what had been done to facilitate the implementation of Lean, and change in general. And finally, the sustainability of Lean activities was assessed in terms of ongoing and future activities planned.

Findings

We present our findings using both overall observations that span across the four cases, as well as representative quotes. Before considering these in detail it is worth giving an overview of the purported impact of the Lean activity for each of the Trusts. For *Pottery* the impact reported included reduced waiting times, improved services for the patient, clearer understanding of the care pathways, removal of duplicated processes, tidying up of areas through the use of tools like 5S's, enhanced staff motivation and better understanding of the roles and relationship with other departments. Clinical departments who had engaged with the RIE reported they had seen some benefits but were unsure if other departments appreciated this view. The impact of the service improvement in *Iron* included increased direct patient care time in the productive ward, reduced waiting lists, improved service for the patient, clearer understanding of care pathways, tidying up of areas and, reduction of stores area in Theatres (from 18 to about 2 or 3). Although staff were beginning to recognise

where problems and issues were, and what changes were need, they were not always given the opportunity to implement change. *Ring* had identified a significant amount of duplication and waste which clinical directorates attempted to address through making processes more efficient. Restructured departments and teams were starting to work together better, but the wider impact of the improvement beyond these work areas was reported as negligible. Some simple changes reported in *Lady* included changing the signage, removing unnecessary data fields from multiple forms, adapting the terminology in clinician's letters to avoid patient confusion. Although, these changes were easy to implement and had resulted in enthusiasm and engagement amongst staff they had not necessarily delivered a smoother service to patients. Larger changes recalled had a sustained impact on patient flow, quality of service and quality of care. The radiology project had reduced waiting rooms from 3 to 1. The participants of this project described it as 'brilliant' as the outcome had given rise to benefits for patient flow, patient service quality, and staff morale.

Defining the customer

An initial issue for all cases related to determining 'the customer', and in turn determining customer value. As outlined above, the essential first step in the implementation of Lean around which subsequent activities are oriented. When participants were asked who 'the customer' was a range of actors were identified. The most common, especially for clinical staff, was the patient as the immediate recipient of care but other groups included Primary Care Trusts (PCT) and practice-based commissioners as the purchasers of care; local and central political organisations as regulators; and other internal hospital departments.

> *'Commissioners are the customers who we meet with on regular basis. The patient is the consumer.' (Clinical Manager, Ring)*

> *"The customer should be the patient but it is not! 'If you've got money you are the customer' which ends up being the PCT, GP, commissioners" (Clinician, Pottery)*

Although the importance of public involvement was noted (Martin, 2008) and even implemented it did not necessarily lead to greater understanding of customer requirements and 'value'. In particular, there were few examples of hospitals working to understand or determine what the patient, as the customer, required, expected or desired in terms of value.

> *'Customer representatives can be on patient groups but the general impression is that the customer requirement has not been fully defined. Therefore service improvements are being undertaken without actually knowing what the customer wants' (Manager, Iron)*

Consistent with Young and McLean (2008) this highlights a degree of ambiguity and uncertainty in who Lean should be directed towards, and in turn as to how it should be implemented. Unlike the recommendations of these authors, however, the definition of the customer rarely took the view of a system-wide 'patient pathway' that ranged from entry into the hospital until discharge.

> *"We don't necessarily view the patient any differently as a result of going through this process" (Manager, Ring)*

As such various and sometimes incompatible notions of the customer and customer value were evident across care pathways, meaning that activities undertaken in one department or stage of the care pathway were not necessarily aligned to those undertaken in others or the delivery of value at a broader system-wide level. As such, Lean appeared to mean different things to different groups within and across the case studies.

Disjointed application

Given the variable and department-specific definition of the customer, it followed that in the majority of cases the implementation of Lean centred on narrow and often disjointed tasks at the department and ward level, with few examples of more service-wide activities (see also Brandao de Souza, 2009). Although there was some recognition of the importance of taking a systems view and engendering 'process thinking', it appeared that those on the ground had yet to fully recognise this view, focussing instead of more small-scale activities without attempting to bring these together into a more comprehensive programme of change.

> *'The big picture is not looked at, [there is a] need to pull people out of the service, to communicate more in terms of the actions by the team members' (Senior Service Manager, Pottery)*

> *'If Lean stayed as it is at the moment, then people like me would continue to use it, but other managers wouldn't and this would remove any possibility for cross directorate work and sharing of information' (Manager, Ring)*

Exploring this further, clinical leaders found it easier to motivate staff and introduce tools where there were defined areas for improvement that could be implemented independent of other departments or organisational units.

> *'Process improvement is easier within departments than across departments. There is no formal process for improving processes between departments' (Staff across Iron)*

Related to this was the recognition that although many Lean projects have made a stride, the impact as it stands was limited, and may even revert to the old state if there was not on-going support and development of Lean:

> *'The impact of the [out of hours] project has been fragmented. It has not really impacted as nothing has been finalised yet or implemented on as grand a scale as we originally thought' (Clinical Manager, Ring)*

A quote from a focus group in Iron succinctly summarises many of the very similar views we encountered in this respect:

> *'What is needed is more significant delivery change and a step change in service improvement. This will be more sustained than one-off minor department improvements e.g. tidying of areas, undertaking 5S events. There is a real concern that these departments will drift back to where they were before' (Focus Group Member, Iron)*

The study found, therefore, that in practice Lean became a constellation of disjointed and poorly connected activities. In most cases these were related to pre-existing performance issues and demands within the given hospital departments. In this sense, Lean was not seen as an opportunity to reflect upon the expectations of customers and the related performance problems, but rather as a technical fix for tackling pre-existing problems or meeting the cyclical demands such as winter pressure and bed shortages.

A tool-based approach

Given the above two themes, our study showed that, in general, the implementation of Lean tended to involve the application of a narrow range of specific tools or techniques. By this we mean that service leaders tended to understand Lean as a collection of stand alone, operational tools, rather than as a broader system-wide improvement philosophy. The most prominent method encountered were 'kaizen blitz' or 'rapid improvement events' (RIE). RIEs were cited as favourable as they provided a faster return for effort, were more visible and did not challenge existing management controls. It was also favoured by the staff as they felt engaged in an improvement process that quickly demonstrated potential results where they had some input.

> *"For the RIE, people were initially cynical but became enthused. Issues were resolved. A whiteboard was set up with a plan of the beds and patients, notes were set up in a similar format and new chairs were provided in the waiting room." (Director, Pottery)*

Although staff participation in these RIEs was enjoyed, often considerably, as they allowed social networks of staff to develop and discuss ideas and innovations , they also appeared to hit rigidities and barriers, where Lean was perceived to 'not go further':

> *'Events had a real application to day to day work of staff and inspired staff immediately after the events. However, they were not followed up on and, this motivation has since disappeared.'(Focus Group, Iron)*

> *'Everyone claims to be doing Lean but they are really just doing a tidy up, playing around the edges. If we can build it into the daily work and culture, that's a big step forward' (Hospital Manager, Lady)*

By focussing on the use of these specific tools, service providers were therefore able to show 'quick wins', typically in the form of micro level service efficiencies, such as those highlighted above. However, this did not easily lead to radical and ongoing redesign of core processes or care pathways. Moreover, the application of these tools was often seen to be direct towards management concerns with operational costs and staffing numbers, rather than raising service quality and experience:

> *'Lean is still fairly misperceived and lots of people still equate Lean with mean and the reduction of jobs and not with value added activity, creating capacity and reinvestment. This is quite frustrating' (Senior Manager, Ring)*

> *'At the end of the day it's going to come back to money even though we shouldn't give this message out because we are not empowering people if we do' (Productivity Manager, Lady)*

Overall we see a range of reasons for this tool-based type of Lean understanding and implementation: first of all, the general lack of training means that Lean is not widely understood by all actors in the system, apart from the 'Lean champions' or 'change agents'. Secondly, there often is no formal incentive or mandate from the top of the organisation to conduct Lean in a structured way, as reflected in the following quote:

> *'Executives would say that the organisation is doing Lean and Lean workshops have been undertaken, but we are not sure that they really understand it properly. Across the Trust, maybe 1% of people really know what Lean is' (Managers, Ring)*

The glass-ceiling of implementation

The implementation of Lean was found to be on 'the fringes' of service transformation with results that led to impressive efficiency gains in the short term (e.g. reducing admissions

forms) but that, in most cases, these stalled or failed to materialise into more widespread and sustained improvements. The core reason for this has already been observed in manufacturing where tool-based implementations yield some initial efficiency gains, yet do not develop the required flexibility into the system through engaging the staff to deal with variety in services, and variability in demand in the long term (Hines et al., 2004; Spear, 2005). Reinforcing this view, the 'kaizen' spirit of Lean, which aims to continuously improve and to change the culture to one which values a continuous drive towards improvement, was often recognised as being not clear when just focusing on the tools:

> *'People haven't learnt that it is a continual process yet and not just a one-off. This will happen but time is needed for this to be realised. If they are given time and space to think about Lean from an objective point of view, then they will get energised' (Senior Manager, Ring)*

The study suggested therefore that, within these conditions, the implementation of Lean is likely to hit some low-lying glass ceiling, whereby small service improvements are made, and often remade, without the underlying lessons being learnt or more system-wider improvements evident. In this sense, those undertaking Lean tasks appear almost trapped in a continually repeating cycle of improvement, with work returning to the status quo in between.

Discussion

Our findings highlight several important aspects of implementing Lean in healthcare. First, there are clear differences in how those implementing Lean define the customer and the subsequent creation of customer value; second there was a disjointed approach to implementing Lean across the organisation; third Lean was widely articulated as a tool-based approach; fourth, implementations projects tended to 'hit a glass ceiling'. These findings are also supported by the literature which shows that few Hospital Trusts follow an integrated and system-wide approach to service improvement (Brandao de Souza, 2009; Radnor, 2010; Spear, 2005; Young & McClean, 2008). Radnor and Boaden (2008) in their wider analysis of Lean within public services warn that a narrow focus on just tools and techniques, particularly RIEs, could fail to align improvements with wider strategy; with service providers getting caught up in short-term activities, rather than the long-term vision. As a result, sustainability activities such as developing a culture of on-going improvement and structured problem solving become neglected.

Reflecting upon these findings, it is interesting to consider the origins of Lean within automotive manufacturing. Although, it evolved over 30 years, starting with the seminal

work of Taiichi Ohno at Toyota, its spread to other manufacturers only occurred when the performance gap between Japan and US manufacturers threaten relative market position. Drawing on the book 'The Machine That Changed The World', where the term *Lean production* was coined (Womack et al., 1990) Western manufacturers soon emulated the shop-floor techniques of Lean, but often found it difficult to establish the equivalent organisational culture and mindset. Moreover, many early Lean efforts within manufacturing showed localised impact only, and fell short of their intended impact on the overall system's performance (Holweg & Pil, 2001). It was only later that other car producers adopted more fully the philosophy of Lean thinking by taking a more system-wider approach.

The findings presented in this paper suggest that healthcare organisations are at a stage equivalent to the late 1980s and early 1990s in automotive manufacturing and are yet to embrace Lean thinking more broadly across the wider healthcare system. Some NHS Trusts, e.g. Royal Hospital of Bolton, claim to be attempting to move their evolution through focusing on quality, cost and delivery across a whole patient pathways (Fillingham, 2008). Therefore, although NHS Leaders were encouraged to take a whole systems view (NHS Modernisation Agency, 2004) it appears no Trusts have managed to develop Lean across a value stream let alone beyond the boundaries of the organisation, for example by linking acute with community provision.

There are two reasons why a broader view may not have been taken in healthcare. Firstly, current structures related to funding, commissioning of services and the regulation of services (through government targets) mean that it is difficult to influence or control the delivery of services beyond the individual organisation. Secondly, as discussed in the case studies, staff members tend to view Lean as a set of 'managerial' tools focusing on 'muda', i.e. waste reduction only, and thus neglecting the wider aspects of 'mura' and 'muri', namely the management of demand and capacity, as well as the creation of an efficient and safe workplace. Until all these concepts are addressed, it is our view that Lean in healthcare will be of a limited impact and largely confined to the application of specific tools to local optimization, with little or no effect beyond these 'islands of excellence'. We argue, therefore, that – in the long term - Lean in healthcare will have to undergo a similar evolution to Lean in manufacturing: from shop-floor based tools, to a process view, and ultimately, to a holistic understanding of pathways across organisations if the benefits of Lean are to be fully realised (Hines et al., 2004).

The findings also indicate some key contextual differences between the public and private sector that result in two critical breaches of the assumptions behind Lean. Firstly, in the private sector the customer and commissioner are the same, which is critical in determining 'customer value'. As Womack and Jones (1996) state *'[..] failure to specify value correctly before applying Lean techniques can easily result in providing the wrong*

product or service in a highly efficient way – pure muda (pg141).' In the context of the English NHS, however, there is a stark separation between those who pay for, albeit indirectly, purchase and receive care. Whilst care is predominantly funded by the public through general taxation, services are commissioned by Primary Care Trusts, and increasingly GPs (Department of Health, 2010) on behalf of their patients, whilst clinicians often refer to the needs of individual patients receiving care. This makes it difficult for service providers to determine what constitutes 'value' and whether they should work towards the value defined by individual patients passing through the service, those who commission services on behalf of their patients to ensure quality and appropriate service or indeed political representatives in government.

Despite changes in commissioning, especially the creation of managed markets to foster more competitive and customer driven services, healthcare systems often articulate poorly customer or rather patient demand, whether at individual or community levels. This, in part, reflects the economics and inherent asymmetries of knowledge typical to most healthcare services, where, as described by McGuire et al (1988) *"the derived demand for health care relies upon the decision-making capacity of the provider"* (p151). In other words as professional bodies or clinicians control both the diagnosis and treatment they can generate demand to ensure supply utilisation.

This ensuing customer-commissioner challenge in our view marks the core problem in taking Lean beyond the initial process-level improvement due to difficulty to distinguish *waste* and *value*. One might argue that any reduction in cost or lead-time was an 'improvement' of the process, however, unless driven by the value definition of the customer this simply does not make a 'leaner' process. Secondly, it appears that healthcare is largely capacity-led and budget-focused, and hence there is limited or constrained ability to influence demand, and or to re-use freed-up resources to grow the business. By understanding and managing demand and capacity, private enterprises are able to re-allocate resources by growing the existing business, or by expanding into new sectors. Yet even if Foundation Trust status is achieved, which in theory gives freedom and flexibilities to manage and reinvest resources, there appears to be little evidence to suggest that NHS hospitals have controlled demand in this way. Conjointly, we argue, these two breaches potentially pose severe constraints of the impact that Lean in *public* healthcare operations. While we acknowledge the efficiency gains that Lean has produced in healthcare, we also question whether the - non adapted - transfer of Lean tools and techniques will continue to deliver further gains at the systems level.

More broadly, our findings highlight the difficulties of translating healthcare management philosophies and approaches developed and established in other industries. Although public and private service increasingly bear many similarities, and in some

countries the distinction is even difficult to make, there remain significant areas of difference (Boyne, 2002). This is particular evident in the UK NHS where services have, for over 60 years, operated within the public sector and been characterized by a high degree of political ideology, organizational complexity and the influence of powerful professional groups. Pettigrew et al (1992) state that *'[..]success in managing change (is)… highly contextually sensitive'* and that *''off the shelf' solutions may only have limited impact'* (pg 28). Similarly, Hunter (1996) highlights the inappropriateness of importing *"industrial concepts and models of management into a complex and professionally dominated service activity like health"* (pg 801). Research over the last twenty-five years highlights in particular the role of professional groups in resisting and weakening healthcare reform (Ackroyd, 1996; Harrison & Pollitt, 1995; Waring & Currie, 2009).

In the case of this study, however, the problems of translation appeared less focused on professional resistance to management change, but more on the ways in which service leaders have translated and redefined Lean to fit their particular work context. In particular, there remains confusion as to what, or who, should define customer 'value', especially in relation to tensions between commissioners and patients. Although professionals have often assumed this responsibility on the basis of treating patient needs, Lean requires a more explicit and standardized definition, which may in the healthcare context remain illusive and contested between a wider range of stakeholders. As such service leaders tend towards a narrow task- and tool-based approach to Lean that involves the application of specific techniques to address (often pre-existing) operational pressures at the departmental level. Moreover, these are often driven to the delivery of 'quick wins' rather than sustained service improvements. Whereas in the past management have struggled to deliver the change envisaged by policy-makers due to professional resistance, it is the incremental and evolutionary uptake of Lean across unprepared, in terms of broader understanding, staff groups that is likely to inhibit service transformation.

Outlook

Reflecting upon the recent White Paper (Department of Health, 2010), it might be speculated that to some degree these two critical breaches might be resolved in the English NHS. The paper sets out a vision of a 'liberated NHS' that places patients in the 'driving seat' of care planning and delivery. On the one hand, it devolves commissioning responsibilities to consortia of GPs who, through engaging more fully with their patients, become the purchasers of care. Although this will not completely resolve the definition of value, it might lead to an 'aligned' or ideally 'shared' definition of value between purchaser and user of services. On the other hand, the provision of NHS care is likely to diversify through a mixed

economy that includes existing NHS hospital becoming, first, Foundation Trusts, and later social enterprises. Such changes might present opportunities for providers to better manage their demand and retain control of financial savings. It could however be equally argued that, as in the past, structural reforms are not necessarily the answer to transforming deep-seated cultures and practices found within the NHS (Pettigrew et al., 1992) and, as such, the evolution of Lean from a 'tool-based' to a 'systems' approach is far from certain.

Lean is a powerful concept for the improvement of processes, and it has undoubtedly a lot to offer to healthcare operations, and the public sector in general. However, as our findings show lean is indeed context-dependent, although not in the commonly assumed sense: the perception that Lean is a manufacturing concept that is hard to apply in a service context is clearly wrong. Instead it is the adaptation from a *private* to a *public* sector context that poses the greater challenge. The future of Lean in healthcare is to develop structures, mindsets and systems which ensure that the significant existing investment in Lean is sustained, while its underlying assumptions are recognised. In order to derive the full benefit of Lean, in any context, there simply is no shortcut to understanding its fundamental principles and underlying assumptions.

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Original Wastes	Examples of Healthcare Wastes (NHSIII, 2007)
1. Transportation	*Transportation:* • staff walking to the other end of a ward to pick up notes • central equipment stores for commonly used items instead of locating items where they are used.
2. Inventory	*Inventory:* • excess stock in storerooms that is not being used • patients waiting to be discharged • waiting lists
3. Motion	*Motion:* • unnecessary staff movement looking for paperwork, • not having basic equipment in every examination room
4. Waiting (Delay)	*Waiting* for: • Patients, theatre, staff results, prescriptions and medicines • doctors to discharge patients
5. Overproduction	*Overproduction:* • requesting unnecessary tests from pathology • keeping investigation slots 'just in case'
6. Over- Processing	*Over processing:* • duplication of information • asking for patients' details several times
7. Defects	*Correction:* • readmission because of failed discharge • repeating tests because correct information was not provided

Table 1: The original seven wastes and healthcare examples

1. Specify the value desired by the customer.
2. Identify the value stream for each product/ service providing that value and, challenge all of the wasted steps.
3. Make the product flow continuously. Standardise processes around best practice allowing them to run more smoothly, freeing up time for creativity and innovation.
4. Introduce ‘pull’ between all steps where continuous flow is impossible. Focus upon the demand from the customer and trigger events backwards through the value chain.
5. Manage towards perfection so that non-value adding activity will be removed from the value chain so that the number of steps, amount of time and information needed to serve the customer continually falls.

Table 2: The Five Lean principles (Womack and Jones, 1996)

Organisation	Methodology	Impact
Scotland Cancer Treatment	Lean	Customer waiting times for first appointment from an average 23 to 12 days and improvement of customer flow time for patients of 48%
Royal Bolton Hospital	Bolton Improving Care Systems (Lean)	Direct savings of £3.1m Death rate for patients fell by a third. The time taken to process important categories of blood fell from 2 day to 2 hours. Average turnaround time in pathology from over 24 hours to 2-3 hours
Nebraska Medical Centre	Lean principles to redesign the work area in the sterile processing centre and in the clinical laboratories	Reduced staff walking by 167 miles a year. Reduce lab space by 825 sq ft and specimen processing turn around time by 20% Reduced manpower by 11 FTEs, who were redirected to other critical work. Average length of stay decreased from 6.29 days to 5.72 days.
The Pittsburgh General Hospital	Lean techniques	Change to the procedure for intravenous line insertion giving a 90% drop in the number of infections after just 90 days. Saving almost $500,000 a year in intensive-care-unit costs.
Flinders Medical Centre	Lean Thinking	20% more work, fewer safety incidents, same budget, same infrastructure, staff, and technology.

Table 3: Example of Lean Implementations in Healthcare (Guthrie, 2006; Radnor et al., 2006); (Fillingham, 2008; Young & McClean, 2008).

Name / type of organisation	Type of organisation	Number of interviews / focus groups conducted	Research period	'Lean' Activity
'Pottery' General Hospitals NHS Trust	General hospital, two sites, employing 3000 people, serving over 300K people.	15 staff interviewed including three senior executives, five senior service managers and, seven senior clinical managers/ clinicians. 3 focus groups held with front line and clinical staff.	August - October 2007	Four Rapid Improvement Events (RIEs) in the Short Stay Unit, Emergency Assessment Unit/ Accident and Emergency, Fracture Clinic and Theatres. Service improvement activity in Diagnostics.
'Iron' Hospitals NHS Trust	General Hospital across 8 sites (99% across 2 hospitals), serving over half a million people, employing 5000 people (3800 FTE).	18 staff interviewed including senior managers, clinicians, nursing staff and support staff. 8 focus groups held with nursing staff and clinicians.	January - February 2008	RIEs taken place within Accident and Emergency and the Medical Assessment Unit. Lean activity was taking place across a number of areas including theatres, outpatient discharge planning, medical job planning tool, pre-op assessment and, pathology. Also some use of the European Foundation Quality Model (EFQM). Productive Ward project.
'Ring' Mental Health Trust	Mental Health Trust across 140 sites from community based teams to wards and day centres, serving 1.2 million people, employing 4000 staff.	25 interviewed including three senior executives, nine service managers, seven clinical managers, three clinicians and three members of the unit that facilitated the improvement activities at the Trust. 2 focus groups held with nursing staff and team managers.	May - July 2008	A number of projects; access to psychological therapy, reduction of time from referral to treatment in neuro-psychiatry, out of hours care looking at crisis resolution and home treatment, the merger of two pharmacy teams and focusing on patient transfer between teams within the substance misuse service (SMS). An internal team set up to support and facilitate the Lean activity – Capability and Capacity Unit (CCU) responsible for organisational training, coaching and running Lean RIE workshops supported by external organisations.

'Lady' Hospital NHS Trust	General Teaching Hospital across two hospitals, serving over a million people, employing around 6,500 people.	19 staff interviewed including senior managers, clinicians, nursing staff, support staff and Lean programme staff	March and April 2009	External consultants facilitated a number of Lean-led projects in the Trust conducting training in Lean principles throughout and, to assist the Trust in formulating a 'programme led' approach to the implementation of Lean. Programme of activity was led by an internal team of nine Lean facilitators and programme managers known as 'IMPaCT' consisting of 18 projects across three streams.

Table 4: Outline of case study organisations