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Construction industry performance improvement programmes: the UK case of demonstration projects in the 'Continuous Improvement' programme

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There has been a range of initiatives across many countries over the last 10 to 15 years to introduce reform to the construction process in order to improve performance. The so-called UK 'Continuous Improvement' programme is evaluated as a case study through an analysis of demonstration projects. These projects symbolically represent best practice for others to follow directly in the UK and through influence indirectly in other countries. This raises methodological challenges, yet the scant empirical attention given to this field justifies such attention. The main conclusion is that there have been improvements, yet these seem not to have been continuous. Contractors are distant from direct value creation, increasingly relying upon others in the supply chain. Improvement measures have not penetrated most supply chains. This suggests that contractors need to develop learning and competency capacity; especially stakeholder management and/or clients need to identify new solution providers. There has been little direct evidence of this and the current environment is placing emphasis upon price rather than value. Capacity and capabilities for continuous improvement appear largely transient and insufficiently embedded to persist where present.

Keywords: Performance improvement, demonstration projects, investment, knowledge transfer management.

Introduction

There has been a range of initiatives across many countries over the last 10 to 15 years to introduce reform to the construction process in order to improve performance. They largely shared in common, at least to begin with, the advocacy for transferring initiatives tried and tested in other sectors to construction, such as partnering, supply chain management, just-in-time production and delivery, lean and agile production—the automotive sector and the Toyota management model for lean thinking being important stimuli (Womack *et al*., 1990; Womack and Jones, 1996). The work of the Lean Construction Institute in the US is one example, influenced by the work of Ballard and Howell (1988) in efforts to reduce waste and improve efficiency. Some of the most important initiatives came out of the UK, particularly because these influenced initiatives and policies in other countries including Australia and Hong Kong. This paper evaluates as a case study the so-called 'Continuous Improvement' programme in the UK through an analysis of demonstration projects, which were administered through various organizations, most recently Constructing Excellence. These projects symbolically represent best practice for others to follow directly in the UK and through influence indirectly in other countries.

The UK Latham Report (1994) commenced a new generation of government commissioned reports, driven by clients. The Latham Report particularly addressed adversarial relations in construction. The Egan Report (1998) was wide-ranging, while more detailed in addressing four areas perceived as important: client leadership, innovation, performance measurement (KPIs), and dissemination of best practice. The Egan Report was client driven and the content was particularly influenced by other sectors, especially the automotive sector. This Report provided a catalyst for reform, sometimes referred to as the 'Egan Agenda', which has been refined and developed

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to embrace a broader set of initiatives (e.g. Egan, 2002), sometimes referred to as the 'post-Egan Agenda'. These agendas combine as what has come to be known a 'Continuous Improvement' in practice and policy (which is inconsistent with conceptual definitions of continuous improvement in innovation theory, partly through difficulty of transfer across sectors where production for sale yields to one-off production services conducted under contract with high uncertainty levels, partly through lack of rigour and negotiated meaning in construction).

While many have felt that there has been little or no progress (e.g. Green, 2006), yet scant empirical research has been put forward to support success or failure of these initiatives. This paper has the overall aim of helping to address this gap. Within the 'Continuous Improvement' programme are a series of demonstration projects, providing project and programme data covering a 10-year period. The demonstration projects were set up to show 'best practice', or more accurately better practice, thus, for knowledge to be transferred, managed and adopted on other projects. This implied corporate investment and programme management of projects within firms, and learning across firms through working on a project and through external transfer of knowledge through the demonstration project learning being disseminated.

The demonstration projects therefore provide a specific opportunity to evaluate evidence for continuous improvement in the UK and contribute generally to evaluating the reforms that have been advocated and initiated in other countries.

Background

Empirical evidence on international performance improvement programmes is scant, and evidence on the UK continuous improvement programmes is too. Bresnen and Marshall (2000) claimed evidence was anecdotal and relied too heavily on exemplar organizations, although it was these organizations that potentially offered scope for pan-organizational knowledge transfer. Since the turn of the Millennium, there have been few attempts at evaluation, especially institutional and within industry.

One report focused on the future rather than progress to date (nCRISP, 2005). Adamson and Pollington (2006) largely considered the changing institutional framework of so-called best practice and continuous improvement. The Latham Report (1994) had advocated moving away from the adversarial culture in the UK. The Egan Report (1998) built on this, advocating a focus upon four areas: client leadership, innovation, performance measurement (KPIs), and dissemination of best practice. Demonstrating the scope for improvement and knowledge transfer was conducted through the programme of demonstration projects, which were initially instigated through the Best Practice Programme and the Movement for Innovation (M4i), and later, these and other bodies were amalgamated into Constructing Excellence in 2003, the most recent vehicle for realizing continuous improvement. Egan (2002) had added social and environmental considerations and the range and diversity of initiatives are frequently referred to as the post-Egan agenda. The purpose of Constructing Excellence was to facilitate delivery of improved industry performance, resulting in a demonstrably better built environment. Constructing Excellence acted as a bridge between industry, clients, government and the research community, and aimed to create and disseminate knowledge about innovation to benefit the built environment as well as the clients and industry working in it. The organization was originally supported by government funding, but transitioned to reliance upon subscriptions and commercial activities.

Adamson and Pollington (2006) in their review erred upon the side of the Latham Report (1994) ahead of the Egan Report (Macmillan, 2006). Adamson and Pollington were concerned with complexity of consultation where accountability was general and largely obscure. While Egan had stressed the importance of measurement in order to make improvements, the benchmarking using key performance indicators (KPIs) does not identify what needs to be improved and the demonstration projects tended to fall short on measurement. Any precise measurement undertaken has limited use where the objectives are frequently blurred and the motives and interests of stakeholders are not always aligned, some parties even being suspicious of others (Adamson and Pollington, 2006). This assessment was in marked contrast to an earlier 'internal' assessment that ushered in the so-called post-Egan agenda. The Strategic Forum for Construction reviewed progress since 1998 (Egan, 2002). In his introductory Statement, Egan said:

> The demonstration projects clearly show that the targets we set were realistic, and that when achieved the result brings benefit to all. I very much welcome the progress made … (p. 8)

Yet the assessment in this report largely focused upon the aggregated KPIs rather than demonstration projects. There was little attempt to assess the dynamics of what was going on at a project level. In addition, the indicators measure projects rather than monitor lessons learnt and knowledge transfer.

There have been other assessments from academe. For example, Larson (1997) on the one hand claimed success from a sample of 291 partnering projects.

Partnering and the supply chain were important themes in the Egan Report (1998). Partnering refers to collaborative working arrangements that are agreed between the parties for a project or across projects through 'strategic partnering' and 'framework agreements'. Conceptually, partnering is located within relational contracting (cf. Williamson, 1985) and tries to achieve the benefits of a domestic market through 'buy' rather than 'make' decisions (Campbell, 1995). Beach *et al.* (2005) examined partnering between main contractors and main subcontractors for structural steel products. They reported that demonstration projects consistently exceeded targets in their field, yet where adoption of partnering practices was constrained clients were claimed to be the main obstacle. These positive findings are echoed elsewhere, notably Hong Kong where integrated teams are less opportunistic with longer-term horizons, higher trust levels, joint risk sharing with pain–gain incentives and value engineering, leading to increases in value delivered (Kumaraswamy and Rahman, 2006). Others (Pryke and Smyth, 2006; Smyth and Edkins, 2007; Smyth and Pryke, 2008) have made similar points noting that considerable investment in organizational behaviour and relationships is needed to switch from reactive project-based responses to proactive commitment of resources and effort to embed these changes as core competencies that are spread across all projects.

Others have been more critical. Mason (2008) says there was 81% awareness of partnering in supply chains he studied. He found 28% of subcontractors entered into various partnering arrangements, yet there was more willingness among subcontractors to partner informally as well as formally than main contractors have been prepared to embrace, echoing along the chain the client–main contractor interface (Beach *et al.*, 2005). This reflects Dainty *et al.*'s (2001) earlier findings that traditional competitive tendering arrangements remain dominant in subcontracting markets. Wood (2005) corroborated the earlier findings of Bresnen and Marshall (2000) that evidence remained anecdotal, while others, for example Cox and Ireland (2006), have stressed that market forces dominate and constrain meeting the policy expectations of continuous improvement. Green (2006) has gone further, arguing that adoption of continuous improvement practices has tended to conceal more than it reveals. In practice 'ideas for improvement remain contested' (p. 236) and 'can usefully be understood as management fashions where the rhetoric is used to try to extract more value at less cost from the supply chain' (p. 236). The dominant player in the supply chain still behaves opportunistically (Green, 1999) and the rhetoric of mutual benefit (Bennett and Jayes, 1995) is in question; Skitmore and Smyth (2009) drew attention to the espoused mutuality still accrued 6:1 in favour of clients as originally set out by Bennett and Jayes (1995). Bresnen (2007) has added to such criticism by deconstructing the 'seven pillars' of partnering (cf. Bennett and Jayes, 1998). However, the shortcoming of much of the academic criticism has been to focus upon a narrow set of continuous improvements, such as partnering and supply chain management, which fall into the conceptual category of relational contracting. Four general positions emerged from this review:

(1) The industry response is largely rhetorical and progress is minimal or non-existent (e.g. Green, 2006).
(2) The industry response is uneven and market constrained, yet some progress has been made (e.g. Cox and Ireland, 2006).
(3) The industry is responding and the market structure and governance is changing through procurement-related initiatives (e.g. Beach *et al.*, 2005).
(4) Where progress has been made, making the response continuous requires considerable investment in organizational behaviour and relationships (e.g. Smyth and Pryke, 2008).

Providing an analysis of demonstration projects over a 10-year period since the Egan Report (1998) will help assess which of the above positions accords with reality in the case of the UK, and may also hold broader lessons and implications for performance improvement initiatives elsewhere.

Research methodology and methods

The approach to this study was qualitative. The form of the data was derived from industry reports of the demonstration projects, which describe activities and events, identify improvements and indicate benefits in some but not all cases to internal and external stakeholders to the projects. The evidence presented in the demonstration projects is assumed as having been accurately reported by respective industry actors. Yet the company and project evidence arise from the perceptions and interpretations of the industry reporters and therefore must be considered subjective. The diverse nature of projects over time and location, plus the range of different actors responsible for reporting the outcomes in the demonstration projects renders a further layer of qualitative variance, which requires interpretation through the research to identify patterns and particular factors of significance. Hence the research is certainly methodologically qualitative and interpretative both in nature and in research design.

However, the scant empirical data from past studies means that this field is still being scoped, and thus treatment of the evidence can be viewed within the methodological remit of critical realism (e.g. Sayer, 1992) as covering three of the six elements set out by Danermark *et al*. (2002): *description* of the concrete complexity and composite events or situation, coupled with some interpretations of the persons involved and their way of describing the events or situation, potentially qualified as well by summative or quantitative methods; *analytical resolution* by the separation or dissolution of the composite and complex by distinguishing the various components, aspects or dimensions using available concepts; and in part *theoretical re-description* (abduction) to re-interpret and re-describe the different components, aspects or dimensions from conceptual frameworks and theories about structures and relations. *Retroduction* as to what properties are essential for object of study to be what it is; *comparison between different theories and abstractions* that evaluate the explanatory power of the mechanisms and structures described by abduction and retroduction, comparing, integrating or rejecting components and processes that are unnecessary, may be pointed towards through this stage, but cannot be assumed acceptable at this level of breadth and depth of evidence and analysis; and finally *concretization and contextualization* that interpret the meanings of causal mechanisms in different contexts and evaluation of the contribution of causal explanations to understanding events could be conducted in the future but are beyond current scope in this field.

An important aspect of critical realism is the appreciation of context. There are essential features of many matters researched that regularly produce certain patterns or outcomes. There are also many matters where the context mediates to aid or inhibit causality, which is prevalent in social contexts. Continuous improvement is contingent upon national context and demonstration projects in the UK are a form of evidence that will not be exactly replicated elsewhere. While research findings may therefore differ by national context and over time, there are generic findings and lessons to be learnt from particular contexts, in this case from the UK to other locations. Such research outcomes will typically be influenced by interpretation of actors in the field and researchers through analysis, yet this adds to richness where these outcomes are based upon solid findings. As noted, evidence has been scant and the field is still being scoped, so it is hoped this research will contribute to providing a more concrete evaluation of performance improvement programmes.

Just as previous evaluations faced difficulties, this evaluation also faces difficulties, particularly concerning method. Selecting the basis for evaluation poses considerable problems. First, all projects cannot be evaluated to examine the extent to which continuous improvement penetrated industry, both horizontally by activity and vertically by size of organization. Second, there are problems identifying and gaining access to all projects that are purported to have engaged with continuous improvement. A smaller yet reasonable population is needed for evaluation. The demonstration projects were chosen for several reasons. While it has been anecdotally suggested that if it looks like a 'demonstration project' it probably is and it has also been suggested that taking part is valuable in its own right, these pragmatic and post-rationalizations of selection are insufficient justification. Of more significance is that demonstration projects were set up to be exemplars of 'best practice' and a means to transfer knowledge across projects and across organizations. The knowledge transfer could take several forms:

(1) Across the sector:
    (a) at the top level;
    (b) through trickle down effects.
(2) Across the firm from one project:
    (a) to other projects for the same client;
    (b) to the programme of projects undertaken for all or core clients.

Evaluation of the progress sensibly takes strategy at face value and compares with the reality on the ground. This is the approach adopted in this paper. The paper examines two types of evidence: aggregate data over a 10-year period and qualitative data over a two-year period at the end of the first decade since the Egan Report in order to identify in greater depth trends for the future.

By 2008, 525 demonstration projects had been recruited and over 150 case studies of these projects had been written up. It is the projects that have been written up that provide the opportunity for explicit knowledge transfer. All demonstration projects offer opportunities for tacit knowledge transfer but by nature this cannot be consistently orchestrated and assured. Tacit knowledge transfer is beyond the scope of this study. The tangible goals for which demonstration projects were instigated provide the justification as a source of evidence. Although many demonstration projects had been written up and are available online (www.constructingexcellence.org.uk/resources/demonstrationprojects/default.jsp), a review had yet to be undertaken. The purpose of the review was to assess the results emanating from all the projects.

The research method was primarily action research (Dunnette, 1976), which involves the researcher being embedded in the field, in this case working with Constructing Excellence as the responsible body for demonstration projects.[1] The UK provides the example

and the more detailed evidence has aspects of case study work (Eisenhardt, 1989), although not in the level of detail required by case study methods as the project data available are insufficient. The sample is 150 demonstration projects representing 33% of the population, selected for the reason that industry actors had written these up in short report format. This is a reasonable sample, yet the fact that only one-third has been written up is itself a constraint upon demonstration and dissemination, even before adoption is addressed. For those written up, the description of practices in most of the cases is very general. What was carried out is not always described in detail and how the practices were carried out is largely absent; a few appear more to be more akin to promotion testimonies than learning resources. Confidentiality and the cost of making learning explicit may be other factors. Although 'toolkits' became part of the early vocabulary of continuous improvement, the demonstration projects provide insufficient guidance for a manager or project manager in another firm to know how to adopt the practices without drawing upon tacit and socialized knowledge through a broader industry network (cf. Nonaka and Takeuchi, 1995). This itself provides evidence that the key criterion for demonstration projects has not been fully met, namely, that knowledge transfer takes place across the sector at the top level and through trickle down effects ((1)(a) and (b) above).

The method involved several steps. The first step was to read the sample of 150 demonstration projects and locate them within a matrix against the 29 continuous improvement categories of initiative identified by Constructing Excellence outside the scope of the action research (see Table 1). Certain categories have been added since 1998, for example sustainability issues, health and safety (cf. Egan, 2002). Some projects could be allocated to several categories. These categories were not given rigorous and specific definitions but were applied in a pragmatic way at Constructing Excellence. Each initiative was given a rating in the research on a scale of 1 to 3 as to how comprehensively it was considered to cover and contribute to improvement under these given categories of continuous improvement. This rating scale is rather limited compared to a 1 to 5 scale. This made the estimate of contribution difficult to assess at times, yet reflects a reasonable range given the level of description reported in the industry write-ups.

The next step was to allocate the categories against themes. These were derived iteratively in the research through consideration of the categories on their own terms and in comparison with the literature. Demonstration projects themes that emerged in the research covered procurement, service and production factors, social and environmental responsibilities. Relational contracting, so dominant in much of the literature that is linked directly to continuous improvement, is located within procurement. Some categories are relevant to more than one theme, which is reflected in Table 1. To an extent the first two themes reflect the Egan agenda, while second two themes reflect the post-Egan agenda. The themes are not watertight conceptually, so as to permit reflection of client and industry concerns as well as academic concerns. Thus the themes are drawn up as:

(1) relational contracting (procurement-related);
(2) service support and production performance;
(3) social responsibility and stewardship;
(4) environmental responsibility and stewardship.

This approach contrasts with KPIs, which provide a different set of indicators, providing an overview. They do not provide the means to establish whether types of improvement by category and theme are pertinent as well as continuous.

Table 1 Categories of continuous improvement among demonstration projects by theme

Relational contracting (procurement-related)	Service support and production performance	Social responsibility and stewardship	Environmental responsibility and stewardship
Early involvement	Design quality	Heath and safety	Environment—process
Integrated teams	Build quality	Training and skills	Environment—product
Procurement	Performance measurements	Whole life value[a]	Whole life value[a]
Contracts	Standardization and pre-assembly[a]	Sustainability—economic[a]	Sustainability—economic[a]
Supply chain management	Knowledge management	Sustainability—social[a]	Standardization and pre-assembly[a]
Lean construction	IT	Fair financial processes	Sustainability—social[a]
Client leadership	Risk management	Community consideration	
Partnering[a]	Value management	Staff consideration	
	Logistics	Community consideration	
	Partnering[a]		
	Innovation		

Note: [a] Category appears in two separate columns.

The next steps address the purely qualitative part of the research. Twenty demonstration projects were selected from a sample of recent demonstration projects for more in-depth analysis, using the following criteria: five projects reflecting typical (or at least not atypical) projects of the last decade; five representative of recent trends; five of the more innovative; and five projects considered successful. Some project initiatives spanned more than one of these criteria. The aim was to draw out some salient points that illustrate recent trends. The selection of projects carries some subjectivity. A strength is the ability to select a range of projects that are both informative enough in description and cover a reasonably representative range of recent initiatives. A weakness is that interpretation used in the research may not accord with the views of others. Each of these projects was analysed to the same depth in the research in order to gain an overview of recent trends, both general patterns and specifics of significance. The paper presents an analysis of nine of these projects at greater depth from the industry reports in order to show some of the implications of both what is reported and what is not reported and to place this content in the broader context of the categories and themes for analysis.

Research findings

Findings and analysis of aggregate data for the decade since 1998

The research findings for 132 demonstration projects covering the decade are presented in several forms. The first form is to present the findings by rating. The second form is presentation of the findings by theme, and the categories within the themes. The matrix of the entire analysis is simply too large to present in a single table and thus organizing the findings in these forms makes presentation and analysis feasible.

The first form of data presentation is by rating of the demonstration projects on a scale of 1 to 3 (3 being the highest rating). A total rating is calculated by multiplying the total number of projects in the category by individual rating scores of performance. These are presented in Table 2. In total 125 (59.5%) categories of continuous improvement received the highest rating, 58 (27.6%) the middle rating, and 27 (12.9%) the lowest rating out of a total of 210 category ratings across the 132 projects. The average rating was nearly 2.47, suggesting in general demonstration project performance has been good, based on rating from the evidence provided in the case study write ups from industry and from a sector perspective as the categories were generated through Constructing Excellence.

The top ranked categories were training and skills, staff consideration, value management and knowledge management, but only 11 projects covered these four categories. Client leadership and innovation, categories directly corresponding with Egan's four areas of focus, were ranked fifth and seventeenth respectively. Lean construction and knowledge management, two popular topics in academic discourse (cf. Koskela, 1992, 2000; Morris, 2004), hardly feature—two projects and one project respectively. Although supply chain management has a low incidence, it has frequently been coupled with partnering in practice.

Two points of analysis are drawn from the top performing categories. First, people issues are traditionally weak areas within construction, yet performance has been excellent against training and skills, staff consideration, and health and safety, indicating a commitment to improve in these areas resulting in successes. Client leadership has also been a success area. This indirectly lends support to the analysis that clients are the organizations with the motive, means and market opportunity to drive through innovation and improvement (Ive, 1995; see also Gann, 2000; Smyth, 2006).

Second, value management is to the fore, which is in line with requirements to add value, although it is unclear whether increased value is meant pejoratively, that is, arising from reducing waste and costs (cf. the high ranking of lean construction), or whether product and service value are increased (cf. the low ranking of design quality, build quality and whole life value).

The lowest performing categories were design quality, whole life value, economic sustainability, fair financial processes, communication, and build quality. However, these lower performing categories represent less than 10% of the continuous improvement initiatives in the sample.

These findings might suggest that continuous improvement placed more emphasis upon efficiency gains than improved product and service effectiveness. This is valid in fulfilling the Egan and post-Egan agendas, especially in the short and medium term. Yet there are long-term limits as to how far savings can be sought without compromising value, the implication being that product and service value require continuous added value for long-term improvement. For improvement to be continuous implies some consistency, which needs knowledge to be transferred across projects and embedded as a capability or competence. Therefore, long-term improvement requires value to be added in the literal sense.

An additional point concerns the low rating of fair financial processes, which suggests the overall dominant market players (client over contractor, contractor over subcontractors) are failing to fully share benefits.

Table 2 Rating of demonstration projects by category

Category	Number of projects					
	Rated 1	Rated 2	Rated 3	Total rating	Average* rating	Rank order
Health and safety		1	3	4	2.75	5=
Training and skills			3	3	3.00	1=
Design quality	1		1	2	2.00	23=
Build quality	3		2	5	1.80	28
Early involvement	1	5	5	11	2.36	18=
Environment—process		4	4	8	2.50	13
Environment—product		1	2	3	2.67	10=
Whole life value		1		1	2.00	23=
Sustainability—social	2	2	2	7	2.14	22
Sustainability—economic	2	2	2	6	2.00	23=
Integrated teams	3	7	8	18	2.28	20
Performance measurement	3	3	8	14	2.36	18=
Standardization and pre-assembly	2		12	14	2.71	9
Procurement		5	14	19	2.74	8
Contracts	1	1	3	5	2.40	15
Supply chain management	1	2	2	5	2.20	21
Lean construction		1	3	4	2.75	5=
Knowledge management			3	3	3.00	1=
IT	2	1	5	8	2.38	16
Risk management				0	—	—
Value management			4	4	3.00	1=
Logistics		1	2	3	2.67	10=
Fair financial processes		1		1	2.00	23=
Community consideration		1	1	2	2.67	10=
Staff consideration			1	1	3.00	1=
Client leadership		2	6	8	2.75	5=
Communication		1		1	2.00	23=
Partnering	3	10	18	31	2.48	14
Innovation	3	6	10	19	2.37	17
Total	**27**	**58**	**125**	**210**	**2.47**	

Note: * Rounded up or down to two decimal places where necessary.

Market leverage or equity is being pursued as a higher priority than equality. It is impossible to generalize from only two initiatives of this type, yet it does further question the claims of 'mutual benefits' (Bennett and Jayes, 1995)—the so-called mutuality advocated by Bennett and Jayes accrued 6:1 in favour of the clients (Skitmore and Smyth, 2007), which may be indicative of practice in the aftermath of the Latham (1994) and Egan (1998) reports.

Breaking the findings down by theme, relational contracting is procurement based, conceptually pursuing types of agreements and contractual arrangements that move away from adversarial relations in traditional contracting by changing market structures and governance (Macneil, 1974, 1978; Williamson, 1985). In practice these are tactical procurement issues that have been raised to the level of project strategy, giving rise to the application of concepts such as partnering and supply chain management. Table 3 contains the findings under this theme.

This theme marginally has the best average rating, of which over 30% of the projects concern partnering, over 17% integrated teams, which has succeeded partnering in recent years, and over 18% pursuing other procurement-based initiatives. The categories of integrated teams and early involvement are evidence of front-end project strategy; hence a management of projects approach (Morris, 1994) rather than just an execution focus (cf. PMI, 2004). In contrast, less than 10% of the initiatives target improvements in client leadership, less than 5% being supply chain management (SCM). SCM, integrated teams, and early involvement received the lowest performance ratings under this theme. SCM is examined in further detail through five SCM demonstration projects (Table 4). In three cases there was a client programme, indicating

Table 3 Relational contracting (procurement-related)

Category	Number of projects					
	Rated 1	Rated 2	Rated 3	Total rating	Average* rating	Theme rank
Lean construction		1	3	4	2.75	1=
Client leadership		2	6	8	2.75	1=
Procurement		5	14	19	2.74	3
Partnering	3	10	18	31	2.48	4
Contracts	1	1	3	5	2.40	5
Early involvement	1	5	5	11	2.36	6
Integrated teams	3	7	8	18	2.28	7
Supply chain management	1	2	2	5	2.20	8
Total	**9**	**33**	**59**	**101**	**2.49**	

Note: * Rounded up or down to two decimal places where necessary.

Table 4 Demonstration projects with SCM as the primary improvement

Case project	Approach project features	(Sub)contractor benefits
Client programme	11% reduction in capital cost 25% reduction in construction time Approaching 100% predictability Approaching zero defects at handover Zero reportable accidents	Increased client satisfaction Lower contractor transaction costs Lower remedial expenditure Increased effectiveness and social improvements
Client programme	Up to 30% reduction in construction time Supply chain efficiency Customer focus	Increased contractor return on capital employed (ROCE) Lower contractor and subcontractor transaction costs, subcontractor repeat business Client design audit and project sign-off
Client programme	Just-in-time delivery and installation Integrated installation and planned maintenance	Lower client costs, increased satisfaction Contractor repeat business
Contractor programme	1st and 2nd tier alliance for contracting in M&E subcontracting 27% reduction in supply chain Overheads 85% reduction in variations	Increased repeat business Risk reduction Decreased design and bidding costs Increased certainty
Contractor programme	Reduced database Require subcontractor to attend workshops Approve general subcontractors Approve five preferred subcontractors	Increased service quality Increased subcontractor repeat business

client desire to encourage learning and knowledge transfer, therefore continuity and consistency of practices across projects. Contractor learning and explicit knowledge application across projects or beyond the life of the client programme was not reported and must therefore be assumed absent. Two cases of contactors treating projects as programmes fell short of a comprehensive programme management. There was also a lack of evidence to support management along entire chains—no evidence being provided that SCM went further than client, contractor and first tier supplier. This is in line with findings elsewhere (e.g. Mason, 2008).

Overall, analysis of these demonstration projects confirms the emphasis over the last decade on relational contracting forms of procurement. This has been achieved through new social norms and informal partnering agreements (cf. Macneil, 1974, 1978) and formal agreements (cf. Williamson, 1985), particularly project partnering and framework agreements (a client or contractor programme of projects). Over the period, partnering became accepted and less 'fashionable' (cf. Green, 2006) in favour of integrated teams. This moves the process of continuous improvement some way from primarily relational contracting and points towards a more behavioural approach, that is from

reacting to client leadership and drivers towards transitioning to proactively spreading and embedding these capabilities in the supplier organizations. Evidence from supply chain management above suggests this was largely unsuccessful for the five cases reviewed. Evidence from other sources suggests that firms have yet to engage with encouraging and proactively developing appropriate behaviours, leaving it to individual responsibility (e.g. Smyth and Edkins, 2007) rather than a capability or competence owned by the supplier firms. The absence of or limited success in spreading and embedding these initiatives may be rendering continuous improvement difficult from lessons learnt. Proactive relationship management requires corporate investment and support (Pryke and Smyth, 2006) and a greater emphasis upon programme and network management (Smyth and Pryke, 2008; cf. Gareis, 2004; Thiry, 2004; Partington *et al.*, 2005). The cases do not present evidence of taking such a proactive approach or expression of interest in using project learning. This suggests reticence to initiate investment to embed best practice across contractor programmes of work. It is possible that industry may not have written up these aspects of knowledge transfer and investment to spread and embed lessons learnt. One reason might be the time lag between write-up and commitment beyond the project, although many of the write ups were conducted months after project completion. While the project-specific nature of information may not constitute 'proof', it is not unreasonable to suppose that industry would report on positive initiatives and benefits that are at the heart of the UK continuous improvement programme, and therefore absence of information suggests absence of concerted efforts to go beyond the bounds of single projects with improvements. This means that for improvement to be continuous either involves continued re-learning of old lessons or requires the barrier for new lessons to be raised rather than building on lessons learnt.

The second theme, service support and production performance, has some overlap with the previous theme (Table 5; cf. Table 3), yet the average rating is slightly lower. Value management, knowledge management, standardization and pre-assembly ranked highest, although few initiatives were in the first two categories. Design quality and build quality received the lowest rankings, which form the two categories most associated with the construction product.

This theme is disparate in nature, initiatives appearing to lack strategic focus, perhaps for project-specific reasons. Transaction cost-related decisions to 'buy' rather than 'make' may be pertinent too (cf. Gruneberg and Ive, 2000), main contractors tending to subcontract with a consequence of relinquishing direct control of production and associated technical added value. The consequence is that added service value is the main option left for main contractors. This focuses on service enhancement through more proactive management than relational contracting solutions to continuous improvement. As noted above, adding value to the service appears to be largely absent beyond project-specific initiatives and client programmes.

The emerging pattern for the first two themes which were prevalent in the first part of the decade suggests that time and cost issues of the 'iron triangle'—time-cost-quality/scope—seem to have received greater attention than quality and scope in fully embracing front-end initiatives from the perspective of the firm (rather than the project per se). Scrutiny of individual cases shows a diversity of innovations, most of which can be classified as management rather than technical, hence concern service support rather than production

Table 5 Service support and production performance

Category	Number of projects					
	Rated 1	Rated 2	Rated 3	Total rating	Average* rating	Theme rank
Knowledge management			3	3	3.00	1=
Value management			4	4	3.00	1=
Standardization and pre-assembly	2		12	14	2.71	3
Logistics		1	2	3	2.67	4
Partnering	3	10	18	31	2.48	5
IT	2	1	5	8	2.38	6
Innovation	3	6	10	19	2.37	7
Design quality	1		1	2	2.00	9
Performance measurement	3	3	8	14	2.36	8
Build quality	3		2	5	1.80	10
Risk management			0	—	—	
Total	**17**	**21**	**65**	**103**	**2.47**	

Note: * Rounded up or down to two decimal places where necessary.

in the second theme. Service support improvements do not seem to be strategically or deliberately embedded in supply firms. It would seem there are barriers to learning and knowledge being transferred from one project to other projects. This might also suggest that industry players are acting in predominantly short-to-medium terms horizons rather than the long-term horizon that is suggested by 'continuous'.

Social responsibility and stewardship is the first of two themes that resonate with the post-Egan agenda, thus the initiatives are fewer. The highest ranked were training and skills, staff consideration, health and safety, and client leadership (Table 6). The first three have few initiatives, the emergent pattern being that first attempts yield success. Once again the reports from industry do not claim to be transferring knowledge and lessons across their activities. It is possible that this is assumed as the case in the same way that industry readers might be gleaning lessons for application from the reports. Social responsibility and stewardship require internal investment that could have been linked to support behavioural approaches, such as relationship management, but this does not seem to have occurred on the basis that it is reasonable to suppose that industry players would wish to report on knowledge transfer and application for improvement across projects.

The final theme, environmental responsibility and stewardship, is marginally the lowest rated before rounding up to two decimal points (Table 7). Standardization and pre-assembly was both the most popular and highest ranked initiative in this category, suggesting effective development of technology and methods in line with UK government policy.

This theme also needs thorough approaches to SCM. On the one hand, this links back to the first theme of relational contracting. On the other hand, it brings into play a qualitative approach to analysis for recent demonstration projects.

Emergent trends in the UK programme of demonstration projects

Table 8 provides a schedule of 20 recent demonstration project cases selected for further analysis. Every project

Table 6 Social responsibility and stewardship

Category	Number of projects					
	Rated 1	Rated 2	Rated 3	Total rating	Average* rating	Theme rank
Training and skills			3	3	3.00	1=
Staff consideration			1	1	3.00	1=
Health and safety		1	3	4	2.75	3=
Client leadership		2	6	8	2.75	3=
Community consideration		1	1	2	2.67	5
Sustainability—social	2	2	2	7	2.14	6
Whole life value		1		1	2.00	7=
Sustainability—economic	2	2	2	6	2.00	7=
Fair financial processes		1		1	2.00	7=
Communication		1		1	2.00	7=
Total	**4**	**11**	**19**	**34**	**2.44**	

Note: * Rounded up or down to two decimal places where necessary.

Table 7 Environmental responsibility and stewardship

Category	Number of projects					
	Rated 1	Rated 2	Rated 3	Total rating	Average* rating	Theme rank
Standardization and pre-assembly	2		12	14	2.71	1
Environment—product		1	2	3	2.67	2
Environment—process		4	4	8	2.50	3
Sustainability—social	2	2	2	7	2.14	4
Whole life value		1		1	2.00	5=
Sustainability—economic	2	2	2	6	2.00	5=
Total	**6**	**10**	**23**	**39**	**2.44**	

Note: * Rounded up or down to two decimal places where necessary.

Table 8 Analysis of a sample of 20 recent demonstration projects

Project	Category	Themes In-depth Analysis
Alliance Partnership across Three Counties	Procurement	RC ▸ see Table 9
	Partnering	RC, SSPP
	Early involvement	RC
	Integrated teams	RC
	Training and skills	SRS
Bermondsey West Partnering Contract—Planned Maintenance, London	Partnering	RC, SSPP
	Community consideration (stakeholder management, customer satisfaction)	SRS
BRE Stable Block Housing Refurbishment Project	Environment—product	ERS ▸
Heathrow Airport Terminal 5	Design quality (standardization)	SSPP
	Risk management (risk absorption)	SSPP
	Standardization and pre-assembly	SSPP
	(off-site prefabrication; modern methods of construction)	ERS
	Environment—product/process	ERS
	Other initiatives included on T5	Varied
Imperial Wharf, London	Partnering	RC, SSPP
	Environment—product/process	ERS
LSBU Energy Centre	Knowledge management (knowledge transfer)	SSPP
	Environment—product/process	ERS
New Acute Hospital Project, Derby	Design quality	SSPP ▸
	Environment—product	ERS
New Bus Station, Macclesfield	Early involvement	RC ▸
	Build quality	SSPP
Porth Relief Road, Glamorgan	Integrated teams	RC ▸
	Supply chain management	RC
	Community consideration	SRS
	Training and skills	SRS
Red Hill School, Worcester	Environment—product/process	ERS
	Community consideration (stakeholder management)	SRS
Redlands Primary School, London	Partnering (collaborative working)	RC, SSPP
	Integrated teams (client–contractor team)	RC, SSPP
	Environment—process (energy and water use)	ERS
Road Diversion Scheme, St Helens	Community consideration	SRS ▸
	Environment—product	ERS
	Environment—process	ERS
Rotherhithe Estate, London	Environment—product/process (Eco Homes status)	ERS
Silk Stream Flood Alleviation Scheme	Environment—product	ERS ▸
	Environment—process	ERS
Solihull Centre for Inclusive Learning	Environment—product/process	ERS
	Community consideration (stakeholder management)	SRS
Specialist Sports College	Integrated teams	RC, SSPP
	Lean construction	RC
	Environment—product/process	ERS
St Barts and London NHS Trust Hospital Project	Environment—process	ERS ▸
St George Wharf, London	Standardization and pre-assembly	SSPP,
	(off-site prefabrication; modern methods of construction)	ERS
Upperton Road Viaduct	Environment—product	ERS ▸

Table 8 *(Continued)*

Project	Category	Themes In-depth Analysis
	Environment—process	ERS
Whitecross High School and Arts Venue, Lichfield	Environment—product/process	ERS
	Community consideration (stakeholder management)	SRS

Notes:
Legend and number of instances:

RC	Relational contracting (procurement-related)	13
SSPP	Service support and production performance	13
SRS	Social responsibility and stewardship	8
ERS	Environmental responsibility and stewardship	20

is considered against the continuous improvement initiatives by the categories employed with the aggregate data. Nine cases are then dissected in greater depth to draw out details about the initiatives.

More detailed consideration of the nine cases is presented in Table 9. There are several emergent trends from the 20 cases reviewed in the research and illustrated in more detail through the nine cases here:

(1) Continuing trend of early involvement and integrated teams.
(2) Continuing increase in projects associated with the environment, both process and product.
(3) Involvement of design and consultant teams in continuous improvement.
(4) Growing numbers of consultants involved with continuous improvement on projects, in particular consultants with environmental expertise.
(5) Growing numbers of stakeholders involved on projects, in particular stakeholders with environmental interests.

The 20 cases, particularly supported by the nine case studies presented here, provide clear evidence of improvements, despite sceptical critics of the Egan and post-Egan agendas (e.g. Green, 2006). However, the evidence continues to be reported as project-specific, without any broader reference to knowledge transfer and lessons applied elsewhere. This further suggests persistent problems with project-specific improvement rather than with making the improvement agenda continuous by cumulatively building upon lessons learnt. In addition, the analysis raises some new problems that have serious implications for the long-term future.

The enduring problem with demonstration projects is the prevalence of project-specific initiatives. First, it appears contractors, particularly main contractors, are still not embedding soft skills learning and new management competencies in their organizations. In other words, knowledge is not being transferred from the project to the corporate level of the firm to be embedded and spread across future projects. Improvement cannot be maintained continuously in the long-term without such investment and associated programme management occurring. Related to this, the increase in environmental initiatives has largely consisted to date of technical matters that are project-specific with little or no immediate transferable value, either specifically or generically.

Second, the environmental initiatives are new and increasing. On the one hand, the capacity has been developed through (probably tacit with some explicit) learning from past continuous improvement, especially partnering (the supply chain) and integrated teams. On the other hand, it is possible there is sufficient momentum behind the environmental-sustainability agendas to ensure this happens anyway, these initiatives being more a celebration of change rather than capacity development through demonstration projects to engender innovative change. Further comparative research of demonstration and non-demonstration projects—taking tacit knowledge transfer from past demonstration projects into account—is needed to clarify the status of outcomes in this category.

The involvement of a wider group of parties, namely design teams, specialist consultants and subcontractors and a broader mix of stakeholders is welcomed. This is increasingly where added value is being identified and delivered. Therefore value creation, especially technical and technological value, is probably being located towards the extremes of supply chains. The consequence is less direct main contractor involvement in production-related improvement, which represents a considerable retrograde step given the emphasis upon innovation in Egan (1998). This leaves the main contractor responsible for service-related continuous improvement. It was noted earlier that much of the innovation has had management rather than technical content. Yet, the analysis above has strongly suggested that most actors and main contractors in particular have

Table 9 A selection of nine recently reported demonstration project cases for further consideration

Project	Category	Project details of continuous improvement initiatives
Alliance Partnership across three counties	Early involvement Integrated teams Procurement Partnering Training and skills	Three counties came together to initiate joint procurement practices. The Alliance Partnership is the first of its type, appointing Scott Wilson and Waterman as the strategic delivery partners to develop relationships with contractors working for the three counties with the objective of enhancing collaborate working for a programme of projects and develop effective supply chain management. Project management systems and an extranet were used as coordination tools to improve effectiveness and efficiency, and a joint ICE training scheme is being linked to the alliance for graduate recruits. Rationalizing county systems and joint procurement are seen as tangible efficiency benefits.
BRE Stable Block Housing Refurbishment Project	Environment—product	Existing stock is an area of environmental was to be refurbished, introducing 'excellent' ratings of BREEAM bespoke and Eco-Homes XB through the use of intelligence buildings items and biomass boilers. Not only is this good practice but also provides an exemplar of avoiding the environmental waste associated with demolition and new build, thus contributing to the reduction of CO_2 emissions.
New Acute Hospital Project, Derby	Design quality Environment—product	Design team involvement engaged the architects in restricting their mobility and vision to appreciate patient conditions as part of the review and improvement of hospital design. A new suite provided the design team with a tool to improve design for visually impaired patients and patients with mobility problems. This is part of a 30-year PFI project with Skanska Innisfree, these innovations being derived from the automotive industry concerning ergonomic design.
New Bus Station, Macclesfield	Early involvement Build quality	The project was commenced in 2003 with the appointment by Cheshire County Council of Mowlem within the local authority environment for the design programme. The arrangement permitted a focus upon quality rather than cost in a climate of trust with contractor and council staff offering each other support and services. The contract incorporated open book accounting during construction and a target cost approach.
Porth Relief Road, Glamorgan	Integrated teams Supply chain management Community consideration Training and skills	Stakeholder involvement was encouraged for construction of 7km stretch of road undertaken by Costain. Supply chain management and the early appointment of a Community Relations Officer were conducted, community engagement being facilitated through local liaison, recruiting and training of local labour. The development and use of local labour injected £15m in additional salaries and wages into the local economy and increased value to the local economy of £20m, 80% of subcontractor expenditure was local and budgetary savings were also achieved to the benefit of client and contractor.
Road Diversion Scheme, St Helens	Community consideration Environment—product Environment—process	St Helens Council engaged Birse Civils to deliver environmental and community benefits. The project included design mitigation for sensitive habitats and species affected by the scheme, creating additional areas of nature conservation value and providing ecological linkages to areas of nature conservation. This specifically included integrating the landscape and ecological principles outlined within the Stanley Bank Environmental Planning Framework and provision of a sustainable urban drainage system, incorporating for example new ponds, wetlands, bunds to alleviate flood risk and acoustic fencing. Workshops and management systems were put in place to achieve benefits above statutory requirements. A range of stakeholder engagement was undertaken and specialist environmental subcontractors employed.
Silk Stream Flood Alleviation Scheme	Environment—product Environment—process	An example of a project involving an increasing number of stakeholders, as well as addressing environmental concerns, is provided by the Silk Stream catchment, which collects water from the London Boroughs of Barnet and Harrow, discharging via the stream to the Brent Reservoir. The September 1992 flood placed considerable pressure on the flood defences. Two temporary flood storage areas consisting of earth embankments with concrete control structures and culverts, plus associated works provided a solution. Clay for the embankments was sourced from adjacent areas to keep construction costs down and reduce environmental impact both through sensitive design and in comparison to offsite sourcing, the clay borrow areas being used to create new seasonal ponds, wet woodland and scrub planting to reverse progressive deterioration identified by the local RSPB and bat groups.

Table 9 *(Continued)*

Project	Category	Project details of continuous improvement initiatives
St Barts and London NHS Trust Hospital Project	Environment—process	Keltbray recycled 99% of the site demolition waste (50 000 tonnes) on the Skanska project, and an acoustic screen was introduced on site for noise reduction.
Upperton Road Viaduct	Environment—product Environment—process	Leicester City Council wished to reduce waste going to landfill. Re-use and recycling was employed with financial benefits anticipated too. A construction waste specialist consultant was appointed to undertake a pre-demolition audit with the implications being explored through a project team workshop. The objective was to induce a waste minimization 'flagship' project.

failed to transfer learning across projects and embed it in the firm to ensure continuous delivery of innovative practices. This raises a question over the role the main contractor plays. While contractors may act as managers of transaction costs (Gruneberg and Ive, 2000) and act as systems integrators (Winch, 2002), it would appear at best they are integrating value added, that is 'iron triangle' content rather than integrating added value in a consistent and continuous way. In summary, contractors are becoming more dependent upon other parties for value delivery and executing projects.

There are limitations to the findings in two related ways. First, the industry reports for the demonstration projects tend to be descriptive of what was achieved with scant attention to how the achievements were brought about. This limits the extent and transferability of knowledge to other organizations. Second, the organizations involved tend to be project-specific in focus. This limits the transferability of knowledge across their own organization and constrains embedding practices from which other projects will benefit. This second point is difficult to corroborate from the research evidence as it is a analytical conclusion by omission. The *continuous* nature of improvement has been a key policy aspect and client driver, thus at the heart of the UK performance improvement programme, so it would be reasonable to expect industry to write up and draw particular attention to efforts to transfer and embed knowledge more widely in its organizations and project teams. This has not been in evidence. Three types of direct evidence lend support to this outcome. First, it was shown that there has been greater emphasis upon efficiency gains than added value in the pure meaning of the term, particularly in the first half of the decade covered. Second, many of the initiatives can only be project-specific, particularly some of the technical solutions in the second half of the decade covered. Third, the more detailed coverage of supply chain management where client programmes were in evidence did not lead to contractors developing management programmes.

Conclusions and recommendations

It was proposed that knowledge transfer from demonstration projects has the potential to take two forms: (1) across the sector; and (2) across the firm from one project to others. Explicit pan-sector knowledge transfer (a) among the top tier of the industry players; (b) on a trickle down basis can take place through industry reporting of the demonstration projects and embedding lessons among the players involved. The findings strongly suggest this has not occurred through the demonstration projects, although categorical 'proof' at a more detailed project and organizational level from future research may help; however, there is sufficient evidence to be reasonably confident of these findings that are also supported by cited secondary evidence in the paper.

Specifically, the explicit knowledge has not been transferred beyond largely general descriptions of improvements. Although these descriptions may have stimulated other parties to try similar initiatives, there is insufficient description of what has been done and how it has been done in demonstration project write-ups to facilitate direct comprehensive knowledge transfer. The main avenue for dissemination becomes some other medium for disseminating improvements, for example the UK Construction Productivity Network events and report. Indeed networking and the so-called 'knowledge on two legs' (Morris and Loch, 2004), that is, tacit knowledge which goes where people are employed and re-employed, is probably a main albeit intangible legacy from the demonstration projects. Tacit knowledge is an effective dissemination means and has probably reinforced other explicit forms of communication. The primary problem with dissemination through tacit knowledge is that it is frequently 'happy coincidence' that new tacit knowledge can be applied to other project contexts and events. This is because tacit knowledge cannot be managed either by firms or by organizations.

The primary conclusion is that there have been improvements in the UK, but these have not been

carried out in a sufficiently rigorous way for continuous long-term improvement. This has implications beyond the UK programme for improving performance in construction. The primary recommendation for the UK is that contractors need to instigate corporate learning, develop and embed competencies for rolling out across their programmes of work, and/or following Edkins *et al*. (2008) clients need to identify other actors to be solution providers and develop effective systems integration. A primary suggestion for other countries is to pay close attention to the corporate investment and support for performance improvement that extends beyond project-specific measures.

The secondary conclusion is that the actors towards the extremities of the supply chain in the UK have been the ones building technical and service capacity. This provides opportunities to increase their role in the market in the long run with the consequence contractors will need to manage a greater number of external project stakeholders, preferably in a nurturing rather than utilitarian fashion in order to reinforce integrated and collaborative working (Smyth, 2008), which could link to investment in capacity and core competency development. The secondary recommendation is that contractors, especially main contractors, need to more effectively manage supply chains beyond the initial tiers (cf. Mason, 2008) and maximize effective external stakeholder management if they are to protect their role. This conclusion and recommendation has application for other countries, yet is moderated by cultural factors and the degree of integration in a particular context.

Future work could consider in-depth case studies of a small sample of demonstration project organizations to evaluate their impact. Similar work could be conducted for KPIs. An international comparison provides another source for further research. The impact of the current recession upon building market share for organizations engaged in performance improvement provides another focus for future research.

Notes

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