

# ISO 18404: A MODEL FOR LEAN TRANSFORMATION IN AN ALLIANCE

Paul J. Ebbs<sup>1</sup> and Steven A. Ward<sup>2</sup>

## ABSTRACT

The literature and case studies reporting lean transformation in the construction/infrastructure sector are rare. This study's objective is to examine whether the Lean Standard, ISO 18404 provides a useful model for lean transformation. By Case Study and Participatory Action Research, the deployment of ISO 18404 and certification journey of a UK highway alliance (the Alliance) is reported, structured around four Themes for lean transformation. Findings are supported by the latest literature along with a quantitative and qualitative survey with those involved in 18404 deployment (n=35/58). The survey data was thematically analysed and is largely articulated through the four Themes for lean transformation. Whilst ISO 18404 is imperfect, it remains that ISO 18404 provides a useful model for lean transformation and can assist with embedding a culture of sustainable continuous improvement in an Alliance.

## KEYWORDS

ISO 18404, Alliancing, Lean Transformation, Lean Leadership, Continuous Improvement

## INTRODUCTION & BACKGROUND

This paper follows Ward and Caklais' (2019) case study that piloted the deployment of ISO 18404 to support organisational lean transformation in a UK housebuilder, Gilbert & Goode (G&G), and papers reporting the development of a Lean Project Delivery System for a UK Client Organisation (Pasquire and Ebbs, 2017; Ebbs and Pasquire, 2018; and Ebbs et al. 2018).

ISO 18404 is an international standard for lean and is proposed as a model for lean transformation (Ward & Caklais, 2019) and organisational improvement (Oudrhiri et al., 2022). When used together with the Royal Statistical Society's (RSS) sector scheme alongside ISO 9001, it provides a Lean Management System Standard that aligns the achievement of an organisations' strategic objectives with its lean architecture (Key Personnel and Tools) and requires demonstrable continuous improvement. ISO 18404 is sector agnostic and only abstractly prescribes how to deploy lean by focusing on aligning an organisations' strategy, architecture, and improvement activities through a series of Lean Competencies and ISO Clauses. For more on 18404 see Ward & Caklais (2019); Ward (2019) and BS ISO 18404:2015. Since Ward and Caklais' (2019) paper, Balfour Beatty Highways UK have been certified to ISO 18404 and have maintained their certification with annual British Standards Institute (BSI) Audits. In 2023, the BSI Auditor noted Balfour Beatty's Lean Management System was continuing to improve. However, in parallel, the ISO 18404 certification for pilot organisation G&G was not maintained. This was principally attributed to a change in Managing Director and many of the ISO 18404 Key Personnel (Lean Leaders and Practitioners) leaving the organisation, noting the previous Managing Director was a Royal Statistical Society certified ISO 18404 Lean Leader who personally delivered lean training to over 100 people (Ward, 2019).

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<sup>1</sup> Technical Director, T&I, Roads, WSP in the UK, [paul.ebbs@wsp.com](mailto:paul.ebbs@wsp.com), [orcid.org/0009-0003-5630-1726](https://orcid.org/0009-0003-5630-1726)

<sup>2</sup> Managing Director, Lean Construct Ltd., UK, [steve@leanconstruct.co.uk](mailto:steve@leanconstruct.co.uk), [orcid.org/0000-0002-5291-7246](https://orcid.org/0000-0002-5291-7246)

In 2019, the researchers were direct employees of a Global Engineering Firm who were tendering for a UK highway alliance framework (the Alliance). This was being procured through an NEC4 Alliance Contract to deliver c.£1.5bn-£3bn. of infrastructure upgrades to the UK's Strategic Road Network. The bid required those tendering to make appropriate tender commitments – ISO 18404 became one of these. The Alliance was commissioned in May 2020 and by March 2025 it will have substantially delivered several development projects and three programmes of work that are key to the Client's Roads Investment (2020-2025) Delivery Plan.

The research focus is on the deployment of ISO 18404 and rests on a single case study (a UK highway alliance) using the four Themes identified by Ward and Caklais (2019) to start framing and reporting the primary and tertiary data collected. The 4 Themes are:

1. Organisational Structure – supportive business model required
2. Roadmaps & Lean Concepts – need dual clarity before the critical mass will adopt lean
3. Leadership – senior leadership participation required and philosophy comes before tools
4. Change by Force – moving to clients specifying lean, training and use of the principles

The literature review below is followed by a summary of the primary case study data before exploring 18404 deployment methods through specific case study examples.

## LITERATURE REVIEW

Ward and Caklais (2019) previously explored the question of whether the 18404 standard could assist lean construction transformations and carried out a literature review using the search terms “ISO 18404” and “transformation” on the IGLC website and on Google. 79 papers were identified and 15 found relevant. They found the four key Themes of interest noted above across the 15 papers. Five years have passed so this literature review was updated through Scopus using key words “Lean Transformation (+ Infrastructure +/-or Construction)” and “ISO 18404”.

### New IGLC Papers

Peltokorpi et al. (2021) provided a view on construction sector transformation and identify five broken sub-systems: a) Products; b) Processes; c) Information and Digitalization; d) Value Creation; and e) Business Models. They observe that a systemic approach is essential for sustainable improvement and that all five sub-systems need to be simultaneously addressed. This partially aligns with the four Themes; however, these focus primarily on organisational transformation whereas Peltokorpi et al. (2021) examine the sector as a whole.

### Other papers

Ward (2019) presented more information about the original certification pilot Gilbert & Goode in the final project report for the Construction Industry Training Board. It provides more detail about the initial pilot rather than any additional insights to report here. Antony et al. (2023) focused on a cross sector survey of Lean Six Sigma Blackbelts to explore the applicability of ISO 18404 to smaller enterprises. They conclude that the standard needs revision. They also provide critique in Antony et al. (2021) where a range of cross sector Lean Six Sigma Experts were interviewed as to the pros and cons of 18404. They concluded the standard is “not fit for purpose”. Oudrhiri et al. (2022) rebutted Antony et al. (2021) with an in-depth explanation of how 18404 works in practice, noting the Antony et al. (2021) work was based on significant general experience with lean six sigma, but no specific experience with the application of 18404. Oudrhiri et al. (2022) provide explanations and information regarding how the standard works in practice by people familiar with its application. Related to the requirement for the systemic change called for by Peltokorpi et al. (2021), Ward and Mossman (2023) explored the business case for Integrated Project Delivery (IPD). They carried out a benchmarking study of project performance and noted that Project Alliancing represents a system change and positive shift in

performance but does not focus on lean. When lean processes and leadership are built onto Alliancing a further significant shift in performance is gained as shown in Figure 1.

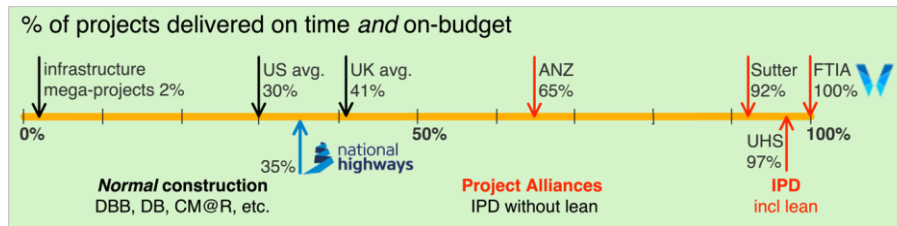


Figure 1: Percentage of projects on time and on budget or better (Ward & Mossman, 2023)

## RESEARCH METHODOLOGY

The methodology was a single Case Study (Fellows and Liu, 2003; Yin 2018). Data were collected from many primary and tertiary sources including lean strategy development and review workshops, lean workshops, 18404 management reviews, leadership team meetings, internal and external 18404 and Highways Excellence Lean Maturity Assessment (HELMA) audits, contract documents and annexes, diary notes, interviews, observations and a survey of the ISO 18404 Lean Practitioner/Leader Candidates and Sponsors. Data were analysed and framed using content/thematic analysis techniques advocated by Braun & Clarke (2006) and Boyatzis (1998) employing a sliding 7-point numerical scale (Nunnally, 1978).

### Survey Data

A survey was conducted with those who were ‘involved’ in 18404 deployment (n=58) rather than the approach taken to review the standard by Antony et al. (2023) where the respondents who reviewed 18404 had little practical knowledge of it. ‘Involved’ meant they had either gone through the RSS approved training, were pursuing individual certification or were one of the 18404 Sponsors. Approximately 10% had left or were leaving the Alliance. The response rate was 60% (n=35/58) with the distribution of respondents aligned to respondents’ roles as shown on Table 3. There were four questions. Questions 1 & 2 were quantitative with the average response shown below. Questions 3 & 4 were qualitative with the analysis in and after Table 2.

1. As an individual, what value have you got from involvement in ISO 18404 to date where 1 = no value and 7 = high value? Average was 5.89
2. How effective is ISO 18404 as a model for Organisational Lean Transformation and Business Improvement where 1 = not effective and 7 = very effective? Average was 6.0
3. Please state your key thoughts on ISO 18404 as an approach to embed a culture of sustainable continuous improvement in an organisation.
4. Please state your key thoughts how 18404 has or has not impacted lean culture, production and/or benefits realisation such as efficiencies or any of the Six Outcomes.

Table 1 replicates Ward’s (2015) Critical Success Factors (CSFs) for lean interventions. The CSF references in the left column of Table 1 are mapped to the sub-themes of right column in Table 2 to show the correlation between the results of the thematic survey analysis with Ward’s (2015) CSFs. Table 2 also outlines additional insights not found by Ward and Caklais (2019). Many examples of CSFs correlating to the four Themes exist. For example, Theme one in Table 2 ‘Org Structure’ relates to the Alliance Model which correlates to the CSFs ‘no blame culture’ (23) and ‘long term relationship or work stream required’ (19) in Table 1. Table 2 shows the broad distribution of 221 mentions (taken from 126 statements) relative to Ward and Caklais’ (2019) four Themes. Most statements typically fell into several Sub-Themes. The analysis was conducted using a simple tally chart to capture the no. of mentions of each Sub-Theme.

Table 1: CSFs Significant Hypotheses (after Ward, 2015)

<b>CSF Reference #</b>	<b>Critical Success Factor (CSF)</b>	<b>Confidence Level</b>
21	The facilitator is critical to success	>99%
18	More than one tool required for success	>99%
10	Management must stay focused on efforts to improve	>99%
17	Relevant data is available or is created	>99%
11	Lean training is required	>99%
14	Staff time out required to focus on improvements	>99%
2	Buy-in from improvement team required	>99%
19	Long term client relationship or work stream required	>95%
8	Lean capability in management required	>95%
23	No blame culture required	>95%
3	Senior management buy-in required	>90%
9	Direct senior management involvement required	>90%
13	Closing actions by improvement team required	>90%

Table 2: Thematic Analysis of Survey Responses (n=35) Mapped to Ward's CSFs

#	Theme	Sub-Theme	No. of Mentions	Ward's (2015) CSF Reference #
1	'Org Structure'	Alliance Model	2	23, 19
2	'Roadmaps & Clarity of Concepts' (n=39)	18404 provides a model/structure/consistency	22	N/A
		Adaptation of lean tools and techniques req'd	9	21, 18, 11
		18404 aligns with org strategy	8	17
3	(Lean) 'Leadership' (& Culture & Community) (n=55)	Mindset and culture change	25	10, 2, 23, 3, 9
		Lean leadership and sponsorship	16	10, 8, 23, 3, 9
		Sense of lean community	14	21, 18, 11, 14, 2, 8, 23, 3, 9, 13
4	'Change by Force' Conditions)	(External Market	0	N/A
4a	Lean as Business as Usual (BAU) (n=98)	Better lean knowledge, tools and competency	41	21, 18, 17, 11, 14, 2, 8, 23, 3, 9
		Realisation of benefits and outcomes	38	10, 17, 11, 14, 19, 23, 13
		Focused lean training & team capability	13	21, 18, 17, 11, 14, 2, 8, 23, 3, 9, 13
		Availability & use of lean support	6	21, 11, 2, 8, 3, 9
5	ISO 18404:2015 Standard (n=22)	Positive view of 18404	14	N/A
		Maturity of 18404 standard	5	N/A
		Certification benefits	2	N/A
		Negative/indifferent view of 18404	1	N/A
6	Concerns	Organisation Change Challenges & Portfolio process & evidence collection	6	N/A

## REFLECTION ON SURVEY THEMES & DATA COLLECTED

Ward's CSFs in Table 1 were correlated to the survey analysis in Table 2 as one could argue that a lean transformation is a series of interventions, and the CSFs are appropriate to both. Below is some discussion around the qualitative data supporting Table 2's Themes and Sub-Themes with the number of mentions from Table 2 denoted in the brackets after each heading. Table 3 outlines the distribution of survey responses from the demographics of those 'involved' in 18404 deployment. These are known as 'Key Personnel' in ISO 18404:2015.

Table 3: Demographics of ISO 18404 Key Personnel (N=48) and Survey Responses (N=35)

# 18404 Trained	Role	Survey Responses
2	Sponsor (Alliance/Programme Leadership Team)	7
4	Sub-Programme Leadership	6
7	Construction Manager/Director	4
4	Site Agent	3
8	Design Manager/Lead	1
3	Supply Partner Manager	2
2	Planner	2
13	Production Hub (Back Office)	8
5	Lean Coach	4

### **THEME 1: ORGANISATIONAL STRUCTURE (N=2)**

A single reference to ‘Org Structure’ was made by a Planner who thought “18404 has added to the collaborative approach of the Alliance and team members feel reassured working slightly out of their normal routines (e.g., a less commercial mindset)”. There was another positive reference about the Alliance by a Sponsor. The Alliance is an Enterprise Model built around Infrastructure Client Group (2017) Project 13 concepts which has helped develop long term relationships, inform the development of the Vision, Mission, and Six Outcomes in Figure 2, and encourage role modelling ‘Trust’ as one of the Alliance’s Six Behaviours. The Alliance model supports Ward’s (2015) ‘no blame culture’ and ‘long term relationships or workstreams’ CSFs and Ward and Mossman’s (2023) move towards IPD. The scarcity of comments relating to org structure suggests that Alliancing is conducive to lean transformation and ISO 18404.

### **THEME 2: ROADMAPS FOR LEAN AND CLARIFICATION OF CONCEPTS (N=39)**

This was broken down into three broad areas and was alluded to in some format by every demographic in Table 3 except for the Planners.

#### **The structure, framework, and consistency of ISO 18404 (n=22)**

30% of this Sub-Theme’s references were from the Sponsors or Programme Leadership and the remaining were spread across the other demographics. One of the Lean Coaches referred to 18404 as a “powerful transformational model”.

#### **Adaptation of lean tools and techniques (n=9)**

References were made to the agnostic nature of 18404 and the need to interpret it relative to infrastructure and job roles. Additionally, as the 18404 course was specifically tailored to lean in the construction sector, there were several remarks about how the ideas and tools taught had changed the Alliance’s approach to delivery. Some statements argued the 18404 competencies were catalysts for change – like Deutschman’s (2007) conundrum of ‘Change or Die’.

#### **Alignment of lean strategy with organisation strategy (n=8)**

Whilst there was not an abundance of statements specifically regarding strategy alignment there were many mentions related to how 18404 was supporting the realisation of benefits and outcomes (n=38). This infers that 18404 is beginning to impact strategic goals. The Hoshin Plan discussed in the Case Study was designed to support realisation of all Alliance Outcomes.

### **THEME 3: LEAN LEADERSHIP, CULTURE & COMMUNITY (N=55)**

Ward and Caklais’ (2019) Theme of ‘Leadership’ was expanded to reflect the statements.

### **Mindset & Culture Change (n=25)**

The difficulties getting buy-in to a lean culture and the impact of 18404 to “win over” mid-senior level leadership and embed large scale change was recognised.

### **Lean Leadership & Sponsorship (n=16)**

The Leadership engagement and the Sponsor role helped generate lean deployment momentum.

### **Community of Practice & Cohort Selection (n=14)**

The positive impact of the diverse selection of Key Personnel trained (including leadership) along with the lean coaching availability and support structure was as another important factor.

### **CHANGE BY FORCE (N=0)**

There were no comments related to change by force. However, the specific requirements for lean contained in the Contract Annex (G) which included a requirement for annual Highways Excellence Lean Maturity Assessments (HELMA) audits (National Highways, 2024), combined with a tender commitment ‘to lead the Alliance to ISO 18404 Accreditation’ provided external force. HELMA ‘forced’ the Alliance to collect appropriate evidence albeit from a ‘show us your best homework’ lens. The Alliance scored 1.7/4 in 2021 and jumped 35% year on year to 3.1/4 in 2023. The moderators noted “since the 2022 HELMA the Alliance have put considerable effort into expanding their lean deployment and building sustainable capability using ISO 18404 as the main method. This has delivered considerable success and there has been a real step change in performance and capability.” Furthermore, the BSI ISO 18404 Stage 1 and 2 Audits in February and March 2024 did ‘force’ many good practices such as the release of the Alliance Policy (combined quality & lean), establishing the Lean Deployment Plan and Dashboard, and helping structure lean deployment vs. an ad hoc lean intervention approach.

### **LEAN AS BUSINESS AS USUAL (BAU) (N=98)**

An underlying theme that emerged in 2023 through the Sponsor sessions, discussions, and strategy updates was that lean was no longer a “buzz word” (Crisp, 2023) and was now part of the Alliance DNA (Slater & Grimm, 2023). The Alliance 2023-2025 Strategy and Production Delivery Plan were published in July ’23 with 27 implicit and 7 explicit references to lean. The high proportion of mentions relative to lean as Business as Usual (98/221), suggests the people and lean competency development approach played a significant factor in normalising lean. As reported by the respondents: “this is the way we deliver projects in the Alliance... [lean] supports us realising our Six Outcomes... the [lean] benefits are felt right across the Alliance”.

## **THE CASE STUDY – OVERVIEW, RESULTS & DISCUSSION**

The case study examines a UK Framework Alliance with six partner organisations who provided programme management, digitally enabled design, and on-site assembly services for highway upgrades. The Alliance then pre-procured a supplier network, to deliver enhancements to positively impact safety, environment, congestion, and asset condition using the Six Outcomes in Figure 2 as shared goals to support the vision and mission.



Figure 2: Alliance Vision, Mission and Outcomes

The Alliance NEC4 contract model is IPDish (Ward & Mossman, 2023) with a single approach to shared risk and reward. The Alliance model supports Table 2’s Theme 1 requirement for the right ‘Organisational Structure’ and Theme 4’s ‘Change by Force’ for lean transformation.

Lean requirements were specified in the Contract Annex (G) and included requirements such as lean leadership, learning and sharing current best practices and adopting key lean tools such as the Last Planner System (LPS) - known as Collaborative Planning in the UK, Visual Management, and lean maturity assessments. Fundamentally, Annex G required a coherent lean strategy and deployment plan to support realising Client Safety, Customer and Delivery imperatives. The client moderated and scored lean deployment through annual HELMA audits (Highways England, 2020; National Highways, 2024) which have been in use since 2009 (Williams, 2023). HELMA was initially reported by Drysdale (2013) under the guise of HALMAT (Highways Agency Lean Maturity Assessment Tool) and alluded to by Nesensohn (2014) in his Lean Construction Maturity Model. Annex G also supports Theme 2’s ‘Roadmaps & Clarity of Concepts’ and Theme 3’s ‘Leadership’ requirements for a lean transformation.

Since inception and throughout the life of the Alliance, a complex set of challenges were faced, including COVID-19 impacts, changing standards and technologies, and changing Government requirements, all of which impacted scope and increased the number and complexity of projects. With respect to lean deployment the biggest initial challenge was to increase lean support capacity and the lean capability of leadership, individuals, and teams. The biggest challenge not overcome was to establish a physical Big Room environment 3 years into the Alliance (Ward & Mossman, 2023) – this was largely due to mobilising in a pandemic, and the dispersed nature of teams and individuals across the framework in the UK, Europe, and India. The countermeasure was pulse-based co-location combined with Big Room workshops as required and digital solutions such as Dashboards and ‘Home Visual Board’ to visualise performance (Szyperki et al., 2023).

### Researchers Background, Experience and Roles

The Researchers (A & B) are Certified ISO 18404 Lean Experts. ‘A’ became certified as a Lean Expert in 2024 and ‘B’ in 2017. The 18404 Lean Expert qualification is like that of a Fellow within a Chartered Organisation and requires assessing every three years with evidence no more than five years old. ‘A’ and ‘B’s’ lean experience totals c.40 years and construction experience



c.70 years. ‘A’ instigated ISO 18404 in the Alliance acting as an internal Lean Coach and chaired the Lean Production Steering Committee. ‘B’ provided external ISO 18404 expertise during the initial bid and after 18404 Business Case approval, having supported two companies through 18404 Certification. The Lean Production Steering Committee had representation from across the Alliance and 113 years of lean experience when established in September 2022.

## **ISO 18404**

The Business Case for ISO 18404 was approved by the Alliance Board in November 2022. The funding was primarily to support c.40 Key Personnel participate in an Approved RSS 18404 Lean Practitioner Course, develop their lean portfolios, and attend their external assessment. A relatively smaller funding envelope supported the auditing and certification process by BSI (British Standards Institute), 24 months of external 18404 coaching for the Lean Production Steering Committee and support for Ward and Mossman’s (2023) IPD study.

For organisational certification to ISO 18404:2015 the link between day-to-day lean improvements and strategic objectives’ realisation must be demonstrated. This broadly focuses effort on two areas:

- Individual Lean Competencies according to Tables B1 & B2 in the standard which require people to demonstrate application of a mixture of soft and hard competencies.
- Organisation conformance to Clauses 4 – 6 normative to ISO 9001:2015 to demonstrate alignment across strategy, architecture, and (quantified) continuous improvement.

## **ISO 18404 STRATEGY & HOSHIN PLANNING**

The Lean Production Steering Committee was responsible for co-creating, revising, and coordinating the deployment of the Alliance Lean Strategy through regular meetings and workshops to support deployment of the wider Alliance Strategy & Production Delivery Plan.

The purpose (why) of the Lean Strategy was “to embed a culture of sustainable continuous improvement by March 2025”. The original breakthrough goals (what’s) were to:

1. Achieve ISO 18404 Accreditation by March 2024
2. Ensure 80% of people approved to work on the Alliance were at a level of lean competency appropriate to their role by March 2025
3. Achieve 5% efficiency savings through Lean Improvement Projects by March 2025

The 3 what’s were revised in February 2024 to reflect an updated Alliance Strategy to include:

4. Improving LEI (Lookahead Execution Index) from 44% to 70% by March 2025
5. Effectively measure RfT (Right first Time) Quality by March 2025

The breakthrough goals (what’s), were originally to be realised through 14 initiatives (how’s) which are summarised under three headings:

1. Developing lean competency through training, coaching and the application of lean
2. Excelling at core lean tools such as the LPS, VM, and Direct Work Observations
3. Sharing and embedding current best practices and lesson learned

ISO 18404:2015 requires demonstrating the link between organisational strategic goals and continuous improvement so the Lean Strategy was revised to reflect a leadership focus on Right first Time. Countless debates occurred on how to measure this which resulted in an even more focused approach to a full LPS adoption and the introduction of a new ‘snag free PPC’ metric TRiFT (Tasks Right First Time) to screen weekly promises for rework and capture reasons why. The original 14 how’s were not all discrete initiatives or interventions. Some did not progress as initially anticipated. They increased to 16 in Feb 2024 when the Lean Strategy was updated to reflect current state lean deployment - less relevant how’s were removed and new ones added.

## ISO 18404 ARCHITECTURE (KEY PERSONNEL, REVIEWS & TOOLS)

The Steering Committee co-created the ISO 18404 architecture and largely codified this as the Alliance Lean Production System. This was a combination of the most relevant of 16 How's in the Lean Strategy plus any emergent best practices such as ELMO (Enough Let's Move On). The lean system was rolled out in the pre-assembly (design) and assembly (construction) phases of all programmes and projects to develop people, excel at core lean tools and realise benefits. A snapshot of the Deployment Plan is in Figure 4. Elmo emoji denotes his deployment date.

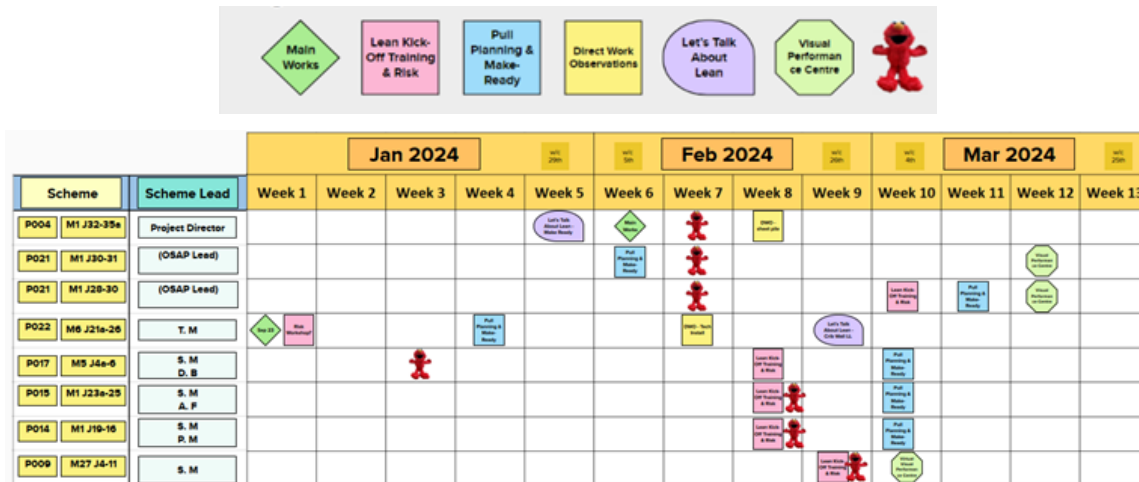


Figure 4: Alliance Lean Production System (ALPS) Deployment Plan (sample of projects)

The ISO 18404:2015 standard requires an appropriate level of Key Personnel to deploy an organisation's lean management system (architecture) in pursuit of strategic objectives. A 5-level lean training and coaching programme was developed and deployed. Levels 3-5 were to ISO 18404:2015 Tables B1 & B2 competency requirements whilst levels 1 & 2 were tailored for lean awareness and day-to-day application. 48 people completed the ISO 18404 training over 12 months in 4 Cohorts with 1 Lean Expert, 3 Lean Leaders and 2 Lean Practitioners certified by March 2024. 26 of the remaining candidates committed to be assessed as ISO 18404 Lean Practitioners (Level 3) by December '24 upon completion of their portfolio of evidence.

18404 Practitioner portfolios were focused on delivering improvement projects and/or deploying core tools and techniques as defined in the strategy. The 18404 Key Personnel were all thoughtfully selected mid-senior level leadership as listed in Table 3. Pull vs. Push was the final factor in selection. The Key Personnel championed lean deployment at local levels to identify and support improvement activities within their programmes and projects to directly improve performance by seeking out and resolving problems collaboratively, making people feel safe to highlight, prevent and learn from mistakes and prevent reoccurrences. The result of this top-down approach to lean deployment was demonstrated in Table 2 where 'Lean Leadership, Culture & Community' and 'Lean as Business as Usual' featured heavily.

The biggest challenge developing the 18404 Key Personnel was the preparation of portfolios. Course feedback of 92% averaged across the cohorts, however, portfolio progress was slow. One of the original 'how's' in the strategy was to certify 20 18404 Key Personnel by March 2024 but by July 2023 it was clear that a countermeasure was required if this was to be achieved. From December 2023, a Sponsor role for the 18404 Candidates was introduced by distributing Candidates across the Alliance Leadership Team. The Managing Director personally sponsored three 18404 Lean Practitioners. In hindsight, this was a top-down strategic approach to sustainable lean deployment. In parallel, monthly 'Portfolio Coaching Clinics' were held to coach people through the competencies and develop action plans to demonstrate the application of 18404 competencies to their role. The Alliance's 18404 architecture was further supported through a Lean Comms Plan shown in Figure 5 using various mediums such as networking and

knowledge-sharing events such as ‘Let’s Talk About Lean’ monthly webinars and annual Together conferences, internal bi-annual Connec7 magazines (SMP Alliance, 2023a, 2023b), and LinkedIn posts that spread the understanding of new initiatives and applications of lean.

	Monthly	Quarterly	Annually
Touchpoints	Single Slide Update	10mins Strategy Update	
Let’s Talk About Lean		Current Best Practice Share	
Digest	Strategy and/or scheme deployment article		
Connec7 Magazine			4 Page Lean Times bi-annually
Events	Supply Network F2F, Together, International Group for Lean Construction (IGLC), NH Lean Practitioner, Highways UK		
LinkedIn	Approx bi-weekly - all of the above e.g., 18404 kick-off, Make-Ready Post, Pull Planning, Training & Coaching		

Figure 5: Lean Comms Plan

Additionally, 18404:2015 normative to ISO 9001 requires internal audits and management reviews. Monthly Leadership Governance and Project Performance Reviews through ALPS Dashboards and quarterly site visits helped demonstrate compliance and identify opportunities.

Organisational Certification requires independent two stage auditing of the Alliance Lean Production System (ALPS), processes, and software normative to ISO 9001. These were defined by the Alliance in Hoshin Plans but recorded formally in Alliance Integrated Management System documentation. In February 2024, the auditor noted zero non-conformances at Stage 1 and during the wrap up the Alliance Managing Director noted “we are embedding lean as ‘the’ thing not ‘a’ thing we do to help us achieve our vision, mission and outcomes (strategy), lean is now part of our DNA and next time we start an Alliance it has got to be from day one, we are now setting a new benchmark for infrastructure performance, every project before us overran”. The Auditor noted it was his third organisation to audit 18404, but he also provided consultancy for another organisation. He noted the systems were “as good or even better than he had seen before”. During the March 2024 Stage 2 Audit the Auditor met with multiple project teams to understand their role in lean deployment to see the results of 18404 deployment. A common theme was how shared understanding (Pasquire, 2012), and detailed knowledge of how to do the work (Spear & Bowen, 1999) significantly improved when using the Alliance Lean Production System. Highlights were one project delivered four weeks early (approx. 10%) which was unprecedented in highways and another project delivered five Emergency Areas (extra safety laybys) within the same time originally allowed to complete three, or a 66% productivity improvement. No non-conformances were found by the BSI and the Alliance was recommended for certification to ISO 18404 by the Auditor in March ‘24.

**CONCLUSIONS**

Systemic change is required to enable sustainable lean improvement. Bolting lean onto a broken system only yields superficial results. The focus here is effective lean construction transformation (systemic change) and whether ISO 18404 is helpful in this regard. Project and Framework Alliancing represent a system change and ISO 18404 also contributes to this by providing a repeatable business strategy for effectively deploying lean that is properly linked with project delivery needs. In the case study presented, Ward & Caklais’ four Themes are clearly present and the additional theme of Lean as Business as Usual together with the positive quantitative survey responses to Questions 1 & 2 provide evidence of sustainable improvement.

**ACKNOWLEDGMENTS**

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