

A SYSTEMATIC APPROACH TO MAKING PEOPLE, PROCESSES & PROJECTS READY FOR MAKE-READY

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ABSTRACT

Project management methods like risk management (RM), production planning (including make-ready) and continuous improvement (CI), are often considered in isolation of each other. The literature recognises how teams struggle with implementing these methods according to known current best practices and standards. The purpose of this paper is to report the on-going development of a research artefact called IRMA 360⁰ (Integrated Risk Management Approach) through a Longitudinal Action Case Study over four cases between 2016 and 2024. There is a particular focus on Case 4 – an ISO 18404 Certified Alliance.

In summary, this research has identified links between RM, make-ready planning and CI, and proposes IRMA 360⁰ as a model to advance the Last Planner® System (LPS) by feeding what ‘might’ happen or might be possible through ‘should, can, will, did, learn’ functions. We conclude that both effective RM and make-ready are required to create and protect value which includes reliable workflow. However, to embed RM and make-ready planning a safe and collaborative environment is desired. In theory, RM is complex as it deals with uncertainty. On the other hand, make-ready is a relatively straightforward activity to ‘just’ screen tasks for constraints. However, in practice both are extremely difficult to implement.

KEYWORDS

Risk Management, Make-Ready, Last Planner® System, IRMA 360⁰, Alliancing.

INTRODUCTION & BACKGROUND

Much has been written about the benefits of the LPS (e.g., Fauchier & Alves, 2013) but less about practical implementation challenges (Ebbs et al., 2018) or underpinning theories that support the LPS. During IGLC30, Ballard delivered a keynote speech titled ‘The Last Planner System and the Waste of Making-Do (Koskela, 2004): a Research Proposal’. This was a broad call for research into three areas 1) Improve input flows; 2) Reduce incentives for making do; and 3) Improve the process for deciding what to do when timely delivery of standard input fails.

Eighteen years of research bookends Koskela’s original paper on Making-Do and Ballard’s call to focus on these research areas at IGLC30. Many scholars, practitioners and standards have made contributions to the LPS (incl. make-ready), RM and flow. The 8 Pre-requisite Flows

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of Lean Project Production have largely emerged from Koskela's (2000) Transformation, Flow, Value (TFV) Theory, Ballard's (2000) Directives, Bertelsen et al., (2007) Preconditions, and Pasquire's (2012; 2017; 2018) work on Shared Understanding. The 8 Flows appear in slightly different guises but for this paper they are: 1) Information; 2) Equipment; 3) Materials; 4) People/Workers; 5) Prior Activity; 6) External Conditions; 7) Safe Space (Physical Space & Wellbeing); and 8) Shared Understanding.

The aim of this paper is to investigate the links between the 8 Flows, RM, make-ready planning and CI. The objectives of this paper are to:

1. Evaluate the practical challenges associated with embedding RM and make-ready planning on projects and programmes.
2. Assess the relationships between collaborative RM, make-ready planning, CI and project/programme reliability.

The remainder of this paper is structured as follows. Firstly, the literature of relevant concepts is reviewed. Secondly, the research methodology used to develop, test, and implement IRMA 360⁰ is outlined. Thirdly, the key outputs from four cases are discussed which includes how IRMA 360⁰ emerged from Ebbs and Pasquire's (2018) Flow Walk; an overview of IRMA 360⁰ with a specific focus on RM and advancing make-ready; a summary of IRMA 360⁰ participant feedback; and, how the rich data generated was used for both CI and to develop the DR.PAMPPSS (Design, Resources, Procurement, Access, Materials, Plant, Permits, Shared Understanding, Safety) make-ready codes and process aligned to the 8 Flows in Figure 3. DR.PAMPPSS built upon O'Connor's (2020) DRAMPPS constraint management technique by adding another 'P for Procurement' and 'S for Shared Understanding' during Cases 3 & 4.

LITERATURE REVIEW – RM & LPS

The RM literature is extensive, and much is beyond the scope of this research. The role of culture, organisational change (Mu et al., 2014; Olechowski et al., 2016), the need to collaborate at the 'fuzzy' front end (Pinto & Winch, 2016; Akerman et al., 2014), understand linguistics (Aven, 2012; Flores, 2013), avoid ignoring risks (Kutsch & Hall, 2010), and improve opportunity management within a holistic and iterative process is recognized (ISO 31000:2018). However, it is clear more case studies on collaborative approaches to RM are required.

There is a plethora of LPS (Hamzeh et al., 2007; Ballard & Tommelein, 2016, 2021; Ebbs & Pasquire, 2019; Mossman, 2020) and Collaborative Planning (CP) guidance (Highways England, 2020) freely available. However, while the LPS Guides provide some detail on how to screen tasks, the CP Guides generally focus more on constraint management than make-ready for every task. Many scholars have reported incomplete LPS implementations (e.g. Daniel, 2017; Hamzeh, 2011; Fireman & Formoso, 2013; Dave et al., 2015; Ebbs & Pasquire, 2018). They observed that whilst project teams may be enthusiastic about the LPS they seem to be unable to grasp the full depth of the system. Furthermore, Daniel (2017) identified that the technique entitled CP is frequently mistaken for the LPS in the UK and that its implementation often stalls at the level of make-ready. Differing epistemological and ontological views of the LPS may be contributing factors to the inconsistency in deployment.

The case study reported by Kamal et al. (2023) represents a recent example of misinterpreting the LPS as they included LPS within 'Collaborative Target Programming' alongside 'pull planning' and 'make-ready' rather than referring to LPS as the overarching system of interconnected parts (Ballard & Tommelein, 2016). Whilst they noted the use of DRAMPPSS make ready planning, they did not credit the sources (O'Connor 2020; Pasquire & Ebbs, 2017; Ebbs & Pasquire, 2018) related to its development.

The research and reporting of make-ready deployment (Ballard & Howell, 1998; Ballard, 2000) is not always explicit and appears limited to a few areas namely lookahead planning (e.g.,

Alves and Britt, 2011), constraint analysis and management (e.g., Lindhard & Wandahl, 2012), Tasks Made Ready (TMR) and Tasks Anticipated (TA) (e.g., Hamzeh et al., 2016), and the operating environment (Britt et al., 2014). Other IGLC literature from Emdanat and Azambuja (2016) and Samad et al., (2017) questioned the impact of many LPS metrics but propose even more LPS metrics that are beyond this paper's scope. Examples of 'making do' are reported by Koskela (2004), Fireman and Formoso (2013), and others. The cost of rework is also widely discussed but outside the boundary of this paper. Whilst both are not explicitly make-ready related, one could argue that making do and rework are symptoms of not making ready.

Regarding integrating RM and LPS, Ballard and Tommelein (2021) recommend conducting project RM in the Project Definition Function with risk mitigation strategies contained on the Project Execution Plan. Additionally, they maintain that the purpose of the LPS is for the Last Planners to create and maintain reliable workflow in pursuit of project objectives. To support this from a RM perspective, ISO 31000:2018 states that effective RM protects the effect of uncertainty on objectives and its purpose is to create and protect value (through opportunity and threat management) by leveraging the input of experts who have knowledge of risks. The eight RM principles listed in ISO 31000:2018 emphasize how critical collaboration is for effective RM and this may also explain why other RM scholars (such as Aven, 2012; Pinto & Winch, 2016) recognise implementation challenges.

In summary, when comparing both RM and LPS there appears to be significant relatedness from both a systems approach and implementation challenges. Both may benefit from closer alignment and learning from some common denominators such as people and available time.

RESEARCH METHODOLOGY

The struggle with make-ready was found in practice (Ebbs & Pasquire, 2018; Ebbs et. al., 2018) and from anecdotal conversations with experienced LPS practitioners at IGLC conferences. As a result, the original singular Case Study methodology was extended to a Longitudinal Case Study (Yin, 2018) using Participatory Action Research (Mackenzie et al., 2012) alongside some Design Science (van Aken, 2004), and post-rationalisation including a literature review of Collaborative RM, Make-Ready, and other RM domains such as Supply Chain RM.

Between 2016 and 2024 data was collected from many workshop participants (n=c.1000) across 15 infrastructure projects. The extensive primary data was analysed using Braun and Clarke's (2006) thematic analysis framework alongside Ebbs and Pasquire's (2018) approach to measure the Level of Conversation (LOC) of each risk and the risk categories that emerged. The LOC was established by totalling the number of survey responses, workshop scribbles, and dots used to prioritise and summarise risks captured through Steps 1-4 of the Flow Walk in Figure 1. Using excel, risks were then mapped to their relative risk categories that were developed through the Flow Walk's Step 5 to define the LOC of each IRMA 360⁰ category.

THE CASE STUDIES – OVERVIEW, RESULTS & DISCUSSION

The Longitudinal Case Study ran between 2016 and 2024. It involved 21 action-research cycles within four case studies to develop the IRMA 360⁰ artefact. Cases 1-3 are detailed briefly to articulate the key findings used as the foundation for nine action-research cycles in Case 4.

Researchers Background, Experience and Roles

The authors are divided into several groups. Author 'A' is a PhD Researcher and ISO 18404 Lean Expert. 'B' is also an 18404 Lean Expert who collaborated with 'A' on make-ready deployment since 2019. 'C' is an ISO 18404 Lean Leader who worked with 'A' on the 3rd and 4th Case Studies. 'D' and 'E' academic supervisors since 2019 and 2021 respectively and Pasquire (2012; 2017; 2018) was 'A's' academic supervisor from 2016-2021. Whilst developing the artefacts the ontological viewpoint shifted from positivist in 2016 to relativist

in 2021 which reflects the complexity and difficulty of deploying RM and the LPS in full and the ontological and epistemological dimensions that emerged as the artefact was developed.

CASE STUDY 1: UK ORGANISATION X (N=150)

The research began in 2016 whilst ‘A’ (supported by Pasquire) was embedded in a UK Client Organisation (X) for 30 months to design, develop and test a Lean Project Delivery System that addressed the root cause of delays and disruption. Organisation X operated in a highly regulated and confidential environment. Some of the main findings were in relation to the need for clarity of purpose, shared understanding, and the challenges sustaining all aspects of LPS deployment - particularly the make-ready process. Ebbs and Pasquire’s (2019) ‘Facilitators’ Guide to the LPS’ was one of the outputs and Ebbs and Pasquire’s (2018) ‘Flow Walk’ emerged as an artefact to help formalise make-ready but also integrate RM into the LPS using the 8 Flows.

CASE STUDY 2: UK TRANSPORT & INFRASTRUCTURE DIVISION (N=145)

With ‘A’ acting as a Lean Coach for a Global Engineering Firm, the Flow Walks went through another four action-research cycles (projects) which formalised as IRMA 360⁰ in 2019. In hindsight, the Flow Walks were a macro-RM approach to make-ready rather than a specific task screening approach (micro). The data collected during all 5 Steps of the Flow Walk in each of the projects proved to be very rich. Whilst the participants noted how overwhelming the data was, this also highlighted the complexity of projects, the need for the right people to be involved early, and the value of the collaborative conversations and shared understanding triggered by the Flow Walk. The Covid Pandemic began shortly before the 4th action-research cycle in Case 2. This required the physical ‘Flow Walk’ to move online which resulted in significantly more data input from the participants during Step 1. Subsequent data analysis identified 272 ‘risks’ within 15 bespoke risk categories. This was circa 3x more ‘risks’ than previously identified.

‘Risks’ in the context of this research include opportunities, threats, assumptions, and pre-requisite make-ready items (typically known as constraints in LPS literature). This categorisation clarified there was more to the Flow Walk and RM than threat management.

IRMA 360⁰

IRMA 360⁰ emerged from iterations of the Flow Walk in 2019 and primarily supports Ballard’s first IGLC30 call “to improve input flows” by using the 8 Flows to trigger conversations about flow. IRMA 360⁰ is proposed as an advancement of Ballard and Howell’s (1998) LPS (not a replacement) to further integrate RM with production planning and control and help structure CI initiatives with RM. Ebbs and Pasquire (2018) report how the development of IRMA 360⁰ started in practice by recognising how teams struggle with make-ready and the concept of flow.

Figure 1 shows how the 8 Flows trigger conversations about what ‘might’ happen or be possible during the Steps 1-5 of the Flow Walk using divergent thinking during Step 1 & 2 to identify ‘risks’, and convergent thinking during Steps 3 - 5 to prioritise ‘risks’ and develop IRMA 360⁰ categories. Figure 1 also shows how the 8 Flows are important triggers for learning and action within the other LPS functions and how the outputs from the Flow Walk inform the development of collaborative milestone, phase, and make-ready plans. For example, whilst phase pull planning what ‘should’ happen, the 8 Flows are helpful triggers to identify predecessors and ‘risks’. To ensure tasks ‘can’ happen as planned, every task must be screened for ‘risks’ during make-ready planning - the 8 Flows or DR.PAMPPSS make excellent prompts. Commitments are made for what ‘will’ be done after tasks are made ready and shared understanding is established. After reviewing what ‘did’ happen, missed commitments (delay and disruption) data can be trended against the bespoke IRMA 360⁰ categories developed during the Flow Walk’s Step 5 ‘Categorise’. When teams need to ‘learn’ from missed commitments for example using a fishbone problem solving template, the 8 Flows are very effective at drawing out causes and effects of a specific problem. In summary, the emergent

data that makes up the IRMA 360⁰ categories after the Flow Walk, supports many conversations during general problem-solving workshops and the deployment of LPS ‘should, can, will, did and learn’ functions. The use of IRMA 360⁰ data is discussed more in Cases 3 & 4. See Pasquire and Ebbs (2017), Ebbs and Pasquire (2018; 2019) for more on the development of IRMA 360⁰.

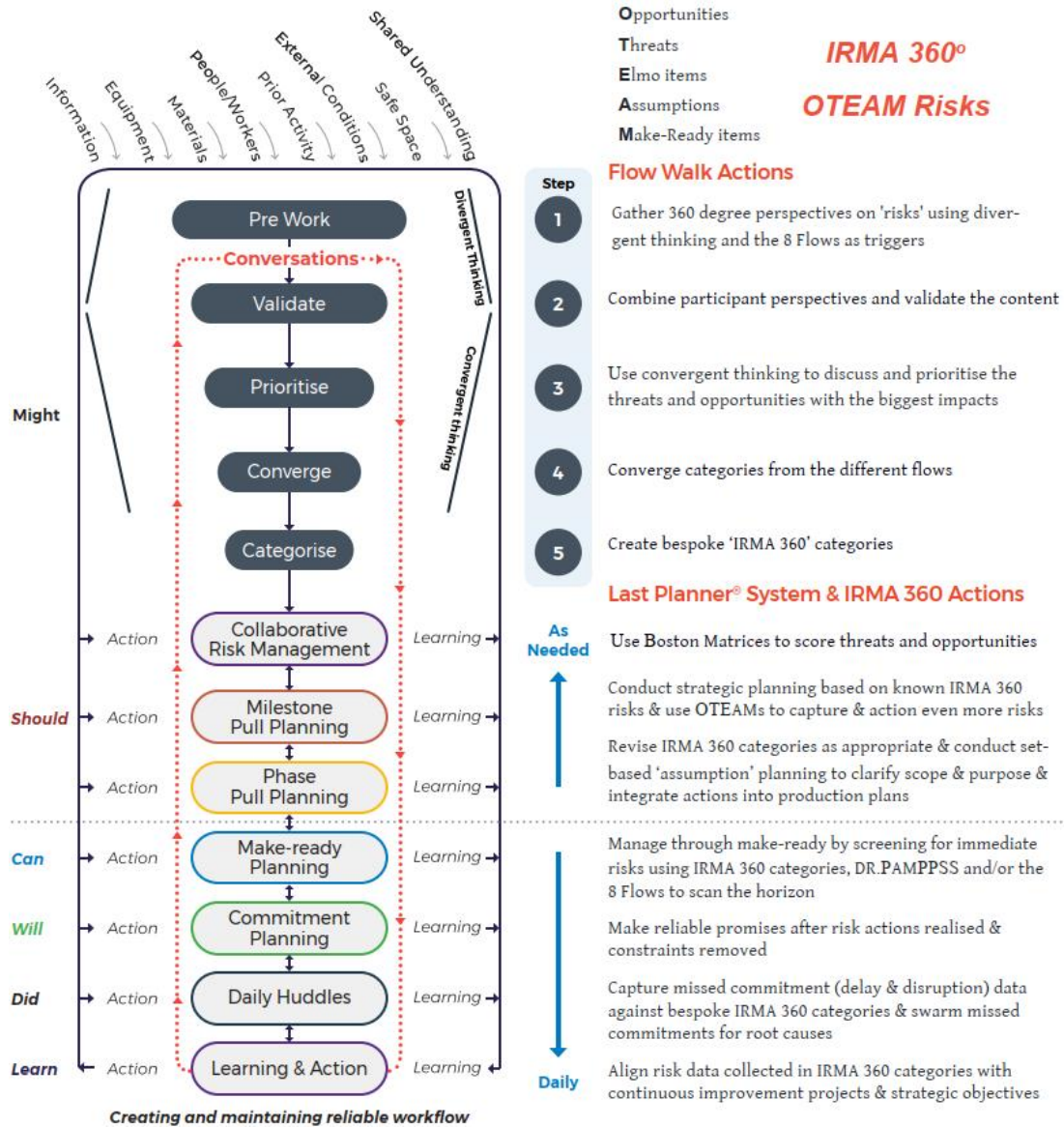


Figure 1: IRMA 360⁰ Framework (after the Last Planner System)

CASE STUDY 3: MIDDLE EAST LOCAL INFRASTRUCTURE PROGRAMME (N=200)

After ‘A’ joined this programme with responsibility for lean deployment a clearer link between IRMA 360⁰ and make-ready emerged. In practice O’Connor’s (2020) DRAMPPS process was less formal than the task-by-task screening approach documented in literature (Howell & Ballard, 1998; Hamzeh et al., 2007; Ballard, 2000; Ballard & Tommelein, 2016). Nonetheless, it was effective and another ‘S’ was added to include ‘Shared Understanding’ as a screening criterion for teams. Teams were also encouraged to map their DRAMPPSS to specific tasks to elevate their timely removal. Kamal et al. (2023) reported the use of DRAMPPSS in a micro tunnelling improvement project but did not acknowledge O’Connor (2020) or ‘A’ as the sources.

In parallel to continuing DRAMPPSS deployment, four IRMA 360⁰ Flow Walks were conducted on four projects at various stages. During these, two more ‘stations’ were added to the 8 Flows to capture ‘Stakeholders’ and ‘Biggest Concerns’. The output was consolidated

through a workshop (n=15) into 22 bespoke IRMA 360⁰ programme categories. After a final round of thematic data analysis 410 specific ‘risks’ emerged within these 22 categories. This data was used on two more projects to develop risk registers from scratch, improve the quality of risk registers and align with programme delay and disruption data collection. Building on ISO 31000:2018’s categorisation of RM, reflection upon the RM literature and practical observations of RM, it became clear that opportunity management was not given the same level of attention that threats were – in practice ‘risks’ are typically only viewed as threats. Furthermore, following Case 2, IRMA 360⁰ ‘risks’ were defined as opportunities, threats, assumptions, and make-ready (OTAM) items. Elmo (enough let’s move on) was introduced in Case 4 and OTEAMs emerged as a useful framework for capturing ‘risk’ conversations requiring action during milestone and phase pull planning workshops. OTEAMs are discussed more in Case 4. The following findings were noted after post-rationalising Case 3. These fed into the action-research cycles of Case 4:

- The Last Planners are also the Last Risk Managers
- Nobody knows more about risks than everybody and everyone is a Last Risk Manager
- Thoughtful early stakeholder selection and team engagement helps avoid threats
- Leveraging multiple perspectives on risks creates rich ‘current state’ data
- Teamwork and diversity are critical to RM
- The IRMA 360⁰ database is a checklist for projects when planning collaboratively
- Major risks are common across similar projects on an infrastructure programme
- The IRMA 360⁰ categories and specific risks are sources for focused CI
- IRMA 360⁰ supports requirements of ISO 31000:2018, 44001:2018 and 18404:2015
- Integrate Risk Managers into IRMA 360⁰ workshops to leverage inputs/outputs and encourage the effective use of the rich data generated

CASE STUDY 4: UK HIGHWAYS ALLIANCE (N=220)

Figure 2 is a team identifying ‘risks’ during the 3rd Flow Walk action-research cycle of Case 4.



Figure 2: IRMA 360⁰ Last Risk Managers during a Flow Walk in Case 4

Ebbs and Ward (2024) share more about Case 4 but in short, the Alliance is an enterprise of 7 partners and a diverse supply network delivering UK highway infrastructure upgrades. Building on feedback from the RM Lead after the 2nd action-research cycle, opportunity management was also incorporated into Step 3 of the Flow Walk illustrated in Figure 2, and into a subsequent mini workshop that used a simple Ease/Benefit Boston Matrix to evaluate opportunities. This was the first time the Flow Walk was used pre-contract award and the feedback noted “good team alignment on threats and opportunities and re-focusing Step 3 to prioritise threats and also opportunities helped shift the mood in the room”. The output was used to create the initial programme risk register and improve collaboration within the Alliance. The RM Lead noted “by bringing risk, planning, and learning into one workshop where all stakeholders are present

has reaped endless rewards. Not just from an engagement perspective but from a lean perspective by pulling all strands together and providing that golden thread between them in one forum. It has enabled all parties to look at the bigger picture and the required interfaces between different work disciplines and third parties and has helped to break down silos. As all parties are involved, this has really set the scene to ensure they are all bought into the same vision and mission. It also helps the understanding of key constraints held by all.”

Like Case 3, the Alliance projects were all at various lifecycle stages. This supported building from Case 3’s approach to rationalise the data under ‘Alliance’ Categories but without the need for a workshop. The categories developed by each project was consolidated by ‘A’ into Alliance IRMA 360⁰ Categories using the LOC technique. The categories in Table 1 summarise the data analysis from across the Alliance. Note that Category #1 is not more important than #16, it only articulates how much conversation took place in relation to the ‘risks’ in each category. Ultimately, the LOC is dependent on who is present to have the conversations.

Table 1: Case 4 Alliance IRMA 360⁰ Categories (n=200)

Rank	Category	Level of Conversation
1	Traffic Management & Roadspace	577
2	Labour & Skills Availability	555
3	Procurement, Logistics & Plant Management	509
4	Collaborative Planning & Programme Management	417
5	Design Information Management	383
6	Expectations, Leadership, Culture & Communication	348
7	Approvals & Governance	299
8	Material Management	299
9	Surveys & Existing Conditions	299
10	Stakeholder Management	269
11	External Conditions	246
12	Safety, Health, Wellbeing & Environment	223
13	Information & Quality Management	137
14	End User/Customer	114
15	Technology	70
16	Commercial Management	68

A similar IRMA 360⁰ Category Framework in Table 1 was developed for Case 3 but 22 categories emerged. The top four categories in Case 3 were 1) Material Management; 2) Labour Availability and Skills; 3) Planning & Coordination and 4) Residents’ Concerns. Case 3 categories provide an interesting correlation between category #2 in Table 1, but also with category #4 which indicates production planning ‘risks’ ranked highly in both Case 3 & 4, albeit the Cases are from different geographical regions and slightly different contexts.

Using IRMA 360⁰ Data for CI & RM

The combined data from four action-research cycles underpins the categories in Table 1. The data was used for various purposes. For example, the first action-research cycle was a highway technology retrofit programme where Traffic Management and Roadspace booking constraints meant several shifts were lost per month. The team used Step 1 of the Flow Walk to collate appropriate data in relation to the 8 Flows. However, due to geographic and Pandemic

constraints and rather than attempting a Flow Walk online, ‘A’ sorted the data into themes. A 2hr online structured problem-solving workshop followed with 20 key stakeholders using the themes created in Step 1. This resulted in no lost shifts and over £500k cost avoidance.

Like Case 3, the other action-research cycles were either during conceptualisation, mid-way through or during the construction (assembly) mobilisation period. The 9th action-research cycle in March 2024 used the 16 IRMA 360⁰ Categories in Table 1 and the 8 Flows to trigger immediate ‘risks’ in each category. Three teams (n=19) from the same programme used this approach during a 1.5 hrs facilitated workshop. Each team worked independently but reported back to the collective group with the Risk Manager recording 49 ‘risks’. During the subsequent pull planning session (n=31) another 59 OTEAM ‘risks’ were identified. Whilst there was some cross-over on risks during both workshops, an additional 9 threats and 12 opportunities were added to the risk register. These workshops also helped to identify 37 mitigations to the 21 new risks, whilst also identifying a further 18 mitigations to 12 threats already on the risk register.

Make-Ready Action-Research Cycles

The roll out of a structured make-ready process shown in Figure 3 was part of a larger 18404 Lean Strategy and involved five action-research cycles. In Dec 2022, 29 OTEAM risks and 39 DRAMPSS were identified during and after a pull planning workshop. In Feb 2023, ‘A’ facilitated a workshop with cross-functional site staff (n=12) using the question “what are the typical reasons why tasks are stopped or disrupted in relation to each of the 8 Flows?”. 34 ‘reasons’ emerged which ranged from not conducting a 24hr weather check to requiring an RFI.

Assembly Make Ready Codes (N=68)									
	D	R.	P	A	M	P	P	S	S
	Design	Resources	Procurement	Access	Materials	Plant	Permits	Shared Understanding	Safety
Monthly	1 TQs	5 Personnel TBC	62 Req's	6 Traffic Mgmt	8 Acquisition Requests	10 Deliveries	13 Enviro & Ecology	16 Site Visit	14 RAMS
	2 RFIs	64 Inductions		7 Roadspace	9 Available	11 CCTV Req's	63 Dig	17 Handover & Maintenance	15 Temp Work Req's
	3 Inspection Test Plans					12 Preventative Maintenance Schedule	65 Quality Plan	18 Stakeholder Engagement	60 Working Area Width
	4 Survey Info						66 Load	59 Contracts	
	68 Inspections						67 O'head	61 Prior Lessons Learned	

Figure 3: Sample Alliance Assembly DR.PAMPSS Make Ready Codes (February 2024)

The 34 codes were piloted, but feedback suggested “there were too many, DRAMPSS is enough”. In March 2023, a version of Figure 4 emerged with another team. The 34 reasons were mapped under DRAMPSS but aligned to the colours/flows used in Ebbs and Pasquire’s (2018) Flow Walk. By April 2023, the ‘codes’ increased to 55 and DR.PAMPSS subsequently emerged after the team identified ‘Procurement’ as a critical make-ready prompt. By February 2024, through workshops to mobilise teams safely, effectively, and efficiently 68 make-ready codes emerged. The DR.PAMPSS codes were used as prompts to screen 60 tasks in 1.5hrs. Figure 3 is a snapshot of the Assembly make-ready screening codes but without the weekly and daily codes (not shown for brevity). Figure 4 illustrates the make-ready screening process using both OTEAMS (captured during and following pull planning) and the DR.PAMPSS make-ready processes. The numbers in the dashed red box on the pull planning post-it on the left of Figure 4 reflect the codes from Figure 3. The different coloured dots with numbers inside reflect

the OTEAMs that were captured on a flip chart during a pull planning workshop and then mapped to specific tasks to identify when the risk actions needed to be completed by.



Figure 4: Examples of OTEAMs & DR.PAMPPSS mapping to phase pull plans

In parallel to the ‘Assembly’ roll out of make-ready, another retrofit programme had to identify and design 138 highway emergency areas within a constrained period. Four of the leadership team were on their I8404 Lean Practitioner journeys which collectively exposed them to various lean principles, theories, and techniques such as flow, change curve thinking, batch size reduction, LPS (incl. make-ready), visual management, and de Bono’s Six Thinking Hats (Ebbs & Ward, 2024). As a result, there was significant coordinated ‘pull’ for lean. The Practitioners (supported by ‘A’) facilitated a series of workshops over 6 days in June and July 2023 to leverage perspectives and help projects mobilise safely and faster (n=80) whilst standardising approaches to design where possible. Following these workshops, the Design Lead asked “ok, so what’s next for lean?”, one of the answers was make-ready. Recognising that ‘not every nail requires a hammer’ a bottom-up approach to ‘Pre-Assembly’ make-ready was implemented. However, rather than conduct a workshop, an 8 Flow survey was conducted (n=24). This resulted in 28 initial codes that increased to 35. These were also structured under DR.PAMPPSS to maintain some consistency with the ‘Assembly’ codes. Some interesting observations emerged. Whilst the leadership were fully supportive and engaged with make-ready and the individual leading make-ready deployment was too, in hindsight, the pre-assembly teams’ understanding of make-ready and the LPS in general was insufficient. ‘Code #31’ was added to capture and trend tasks ‘not screened’. By Nov 2023 #31 equated to 60% of 4,500 tasks. Additionally, there was also reluctance to share the initial ‘poor’ TMR scores because it was assumed the ‘wrong’ reaction might be provoked. This knowledge provided more focus on the screening process and transparent reporting of TMR data.

In Nov 2023, the ‘make-ready’ lead then undertook the 18404 course reported by Ebbs and Ward (2024). During their Sponsor session in Dec 2023, they noted “I now know why you were asking me to do all these things including collecting and sharing the data, had I known what I know now I would have been even more disciplined with the roll out of make-ready, huddles and visual management. To be honest, I was only doing it because you asked me to [and I trusted what you were doing]”. Furthermore, during the Stage 1 ISO 18404 External Audit in Feb 2024, the Auditor asked to see TMR Pre-Assembly data, but it transpired the make-ready lead had left the Alliance and the data trail was not updated for 3 weeks, which suggested some people relaxed their approach to make-ready without leadership. Overall, from September 2023 to Jan 2024 initial Pre-Assembly make-ready deployment data analysis showed TMR increased from 15% to 62%, and LEI (Lookahead Execution Index) went from 54% to 72%. LEI is a client measure of programme certainty. It takes the planned starts and finishes within a reporting period and records if those planned starts and finishes were achieved. The practical output of this and general lean deployment in the Alliance, which was heavily focused on RM, make-ready, and CI, reduced some project initiation to mobilisation periods by approximately 50%.

Elevating the Importance of Make-Ready: Moving the focus from Did to Can

The background to elevating the importance of ‘make-ready planning’ was in part related to deploying ISO 18404 to embed a lean culture and make lean normal practice. However, it was also vicariously related to IRMA 360⁰ deployment as the rich data generated included many make-ready items within the ‘risks’ which highlighted the need for a more structured make-ready approach. The Alliance created a Single Page Lean Strategy with more detailed plans to support and structure deployment of critical elements such as training and coaching, visual management, the LPS, and specifically make-ready. The Alliance also created a ‘rich picture’ to show a programmatic and outcome-based intent. This evolved as the Alliance and lean competencies matured. For example, ‘Progress Tracking’ was replaced with ‘Make-Ready Planning’. Whilst the focus on make-ready formed part of a wider lean deployment through an 18404 framework to develop the lean competency of key mid-senior leadership, the make-ready pilots also influenced more strategic updates to the Alliance strategy (Ebbs & Ward, 2024).

CONCLUSION

The primary contribution of this research demonstrates how to improve input flows through the IRMA 360⁰ framework based on the collective input from the ‘Last Risk Managers’. Within a complex project delivery or organisational improvement paradigms, significant thought and collaboration is required. Projects, strategic objectives, and improvement activities are realised from many conversations which constantly occur between the Last Risk Managers. Outcomes are ultimately the result of establishing shared understanding between people, however, the process of realising outcomes inherently involves RM, production commitments, rework, making do, and learning. Whilst the theory of make-ready ‘to screen every task for constraints prior to committing to production’ is relatively simple, this research highlights that embedding make-ready planning (and the ‘full’ LPS) is much more complex. Many contributing factors require consideration such as the operating environment, contract model, and knowledge and understanding of the LPS which includes make-ready and linguistics.

Aven (2012) emphasized the need to understand linguistics in RM and Flores (2013) articulated how we invent the future through conversations. IRMA 360⁰ is a system that helps facilitate conversations to understand risks and concerns before making commitments. The common denominator in conversations is people, however, their ontology naturally differs based on their socio-technical constructs. Therefore, the more of the ‘right’ people in the room, to have the right conversations at the right time, the richer the conversations. You don’t know, what you don’t know until you know it, and knowledge of risks alone does not equate to understanding and in some cases as Kutsch and Hall (2010) posit, leads to ignoring them.

In conclusion, we propose that an integrated approach to collaborative RM and make-ready within a LPS framework to trigger and capture the conversations that emerge with the required commitments for CI is useful. Furthermore, for effective production planning and control RM, make-ready planning, and CI cannot be considered in isolation of each other. Whilst IRMA 360⁰ appears to support this integration, a collaborative systems thinking environment is also desired (such as the Alliance model reported in Case 4) to help people feel safe to become ready for make-ready and integrate RM with the LPS. Whilst the generalisation of the case study findings of this research may be harder without further independent testing of IRMA 360⁰, the implementation challenges of RM, make-ready and the full LPS are well recognised. There is a plethora of guidance and research on RM, LPS and CI but the empirical evidence provided here suggests IRMA 360⁰ may help integrate these approaches and provide the framework to not only formalise make-ready planning at the heart of project conversations but also integrate RM with the LPS as a standalone [risk] management system that ISO 31000:2018 calls for.

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