

The lean journey of the finnish real estate.

La travesía lean del sector inmobiliario en Finlandia.

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Fecha de Recepción: 29/08/2023

Fecha de Aceptación: 27/11/2023

Fecha de Publicación: 21/12/2023

PAG: 59-65

Abstract

Nothing teaches us more than our experiences. That was the main reason why the Finnish construction industry has not only studied Lean and IPD but also launched several pilot projects by public owners to learn, adapt Lean principles in practice, and develop an IPD model suitable for the Finnish construction industry.

The IPD model demands teamwork and adapting Lean and IPD industrywide is also teamwork. In Finland, several owners and service providers have been working together since 2010 sharing their learnings in workshops, seminars, and conferences.

Over 100 IPD projects have also been a platform for several academic papers. The Finnish Universities have published tens of master's and doctoral theses during the past 10 years on Lean construction, IPD, and alliance models.

The Finnish construction industry has gained major benefits and made important progress on its Lean journey. Lean philosophy and tools have delivered tangible cost savings in projects and services and improved cost estimates, schedule adherence, quality, integration, and collaboration in construction projects.

Finland has succeeded in creating smooth and practical discussion and development forums that have shaped the whole industry. The key drivers contributing to this progress are collaboration and integration, confidence-building between the partners as well a deeper understanding and application of the Lean principles in construction. As a result, Lean and integrated project execution are already reflected in the strategies adopted by many companies and client organizations.

Keywords: Alliance model; culture change; IPD-model; lean construction; lean journey.

Resumen

Nada enseña más que nuestras experiencias. Esta fue la razón principal por la cual la industria de la construcción en Finlandia no solo estudió Lean y la Gestión Integrada de Proyectos (IPD), sino que también efectuó varios proyectos piloto a cargo de mandantes públicos para aprender, adaptar los principios Lean en la práctica y desarrollar un modelo IPD adecuado para la industria de la construcción finlandesa.

El modelo IPD requiere trabajo en equipo y adaptar Lean e IPD a nivel de la industria también es un trabajo en equipo. En Finlandia, varios mandantes y proveedores de servicios han estado trabajando juntos desde 2010, compartiendo sus aprendizajes en talleres, seminarios y conferencias. Además, más de 100 proyectos IPD han sido una plataforma para varios artículos académicos. Las universidades finlandesas han publicado decenas de tesis de maestría y doctorado durante los últimos 10 años sobre construcción Lean, IPD y modelos de alianza. La industria de la construcción en Finlandia ha obtenido importantes beneficios y ha avanzado en su camino Lean. La filosofía y herramientas Lean han generado ahorros tangibles de costos en proyectos y servicios, así como también han mejorado estimaciones de costos, cumplimiento de plazos, calidad, integración y la colaboración en proyectos de construcción. Finlandia ha tenido éxito en la creación de foros de discusión y desarrollo, fluidos y prácticos, y que han dado forma a toda la industria. Los principales impulsores que contribuyen a este progreso son la colaboración y la integración, la construcción de confianza entre los socios, así como una comprensión más profunda y aplicación de los principios Lean en la construcción. Como resultado, una ejecución de proyectos, Lean e integrada, ya se refleja en las estrategias adoptadas por muchas empresas y mandantes.

Palabras clave: Modelo de alianza; cambio cultural; modelo IPD; construcción lean; viaje Lean.

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1. Introduction

Lean is a management philosophy developed in Japan in the 1970s and encapsulated in several principles such as generating value for the customer, reducing fluctuations and waste in production, continuous improvement, and respect for people. A Lean-inspired management system is based on the standardization of work procedures, the working environment, and processes. Standardization creates the necessary preconditions for improving management performance (Lean Construction Institute, 2023).

In construction, the concept combines the principles of Lean management and overall optimization with a smooth production flow. Unlike the traditional approach, where each project partner has their objectives, Lean construction focuses on the value delivered to the customer through collaboration between the various partners. Value is created through more extensive collaboration and the optimization of the whole, known as integration (Lean Construction Institute, 2023).

Where possible, the individual partners are integrated into the project as early as possible. This type of integration is used in all Integrated Project Delivery (IPD) models, the most advanced of which is the project alliance (Ballard and Howell, 2005). While the alliance model is commonly used in Finland, it is increasingly being complemented by other IPD models based on lighter integration (Saarinen, 2022).

The first article on the application of Lean philosophy to the construction industry in Finland was authored by Lauri Koskela back in 1992. More extensive research into Lean construction commenced at the University of California, Berkeley, at the turn of the millennium when Koskela also published his doctoral thesis on the subject (Koskela, 2000). Studies suggested that contrary to the conventional approach focusing on specific projects, many recurring elements in construction projects can be standardized. However, Lean construction did not take root in Finland until the 2010s, when integration and the alliance model began to gain more ground.

Project alliances make use of methods and tools based on Lean philosophy, such as Takt Production, the Target Value Delivery process (Ballard, 2011), and the Last Planner System® (Ballard, 2000) developed by Professor Glenn Ballard of the University of California, Berkeley. The use of these tools quickly became widespread in Finland, leading to a growing interest in the Lean philosophy among IPD project partners. By 2023, more than 100 integrated projects have been launched in Finland to a total value of about EUR 10 billion. Over the past few years, the model has been increasingly applied to conventional procurement methods.

Finland has taken bold steps in embarking on the Lean journey, and the development of the construction sector has gained momentum over the years following the successful execution of dozens of integrated projects facilitated by smooth cooperation between various parties. Integration and continuous improvement have helped Finns create a culture where innovation and efficiency go hand in hand. One of the key players to this success is close cooperation between contracting entities.

The start of Finland's Lean and alliance journey

Globally, the first steps on the Lean journey in the real estate and construction industry were taken after the publication of Koskela's doctoral thesis in the United States in the early 2000s. Subsequently, Berkeley University, Sutter Health, and Kaiser Permanente set out to improve the efficiency and productivity of their construction projects. Development efforts were also driven by other procurement methods that underlined the importance of integration in Lean thinking. Sutter Health named five individual visions for their projects, namely, close and genuine collaboration, optimization of the project entities, continuous improvement, project as a network of commitments, and improvement of team spirit.

Around the same time, the project alliance model was developed in Australia and initially introduced in the UK, where it was piloted in two North Sea gas and oil projects. In contrast to the integrated projects executed in the United States, the Australian project alliances for infrastructure projects highlighted contractual aspects and a range of performance indicators rather than management philosophy. Contracts were seen as a tool for facilitating inter-partner integration and transparency. The projects also identified specific development and execution phases and introduced risk and benefit-sharing between the contracting parties. The performance of project alliances was measured using indicators such as KRA (Key Result Areas) and KPI (Key Performance Indicator).

The Australian alliance model was introduced to Finland during 2009–2010. Important players in promoting the alliance model were the VTT Technical Research Centre of Finland, the Finnish Transport Agency (currently the Finnish

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Transport Infrastructure Agency), and the Helsinki University Properties who did not hesitate to adopt the new model (Hietajärvi et al., 2017). Another important development was that contracting entities and service providers set up joint workshops to adapt the model to Finnish conditions and culture. At the same time, the Finnish Property Owners Rakli, the Confederation of Finnish Construction Industries RT, the University of Oulu, and the Lean Construction Institute USA established the Lean Construction Institute Finland (LCI Finland). Its mission is to coordinate the efforts to harness Lean philosophy in the real estate and construction sector and to promote related development, research, and communications by organizing development projects and seminars. Hence, Finland adopted both the Australian alliance model and the Lean construction frame of reference to support it.

The first construction project executed in Finland using the alliance model was the upgrade of the Lielähti-Kokemäki railway line commissioned by the Finnish Transport Infrastructure Agency in 2010. Since then, Finland has seen the highest number of integrated projects in the world relative to the total volume of the construction sector (Tila - Väylävirasto, 2003.).

What has been done to promote the progress of the Lean journey in the construction industry?

From the very beginning, Lean construction in Finland has been characterized by a strong determination to develop the entire industry systemically. In the early 2010s, LCI Finland and Rakli, in collaboration with Vison Oy, launched two joint public-private partnership projects. Said projects molded into two powerful research and development programs in the real estate and construction sector. The programs seek to raise the level of Finnish project and service expertise to the highest international standards. One of the two group projects involved construction companies, engineering firms, and construction specialists, while the other one involved contracting entities.

These group projects laid the foundation for the successful proliferation of IPD projects and the adoption of Lean business models. The contracting entities' IPD development programs and corporate RAIN (RAIN Projects - LCI Australia, n.d.) are currently working in close collaboration to boost systemic development in the real estate and construction sector (Figure 1). Now, over ten years after launching, these development programs keep growing in popularity and the numerous pilot projects they have inspired have yielded valuable lessons for the development of the entire sector (Construction Site Magazine, 2023).

Contracting entities' IPD development program



Figure 1. Real estate and construction sector development projects in Finland

Contracting entities' IPD development program

Contracting entities' IPD development program was commenced in 2014 with the launch of the IPD1 project (IPT1-Hanke (2014–16)). It involved eleven public contracting organizations, such as the largest Finnish cities, the Finnish Transport Agency, and Finavia (formerly Finnish Civil Aviation Administration), all among Finland's most important public contracting entities (Finavian investointi, 2013). Under the IPD1 project, the alliance model was developed in twelve pilot schemes. Piloting was designed to standardize the formation of alliances to ensure that public procurement complied with the EU's new public contracts directive. The establishment of integrated projects has been an efficient, transparent, and evolving process, and no alliance procurement project has ever been challenged by an appeal to the Market Court. Figure 1 depicts the arising of IPD1 and its subsequent evolution.

From the beginning, the alliance model adopted by contracting entities has been tested in appropriate projects with the full participation of all parties and the outcomes have been publicized. The pilot projects have generated Value for Money reports which have been harnessed in research. It is the pilot projects that have laid the foundation for collaboration and cultural change in the construction sector.

The IPD2 project (IPT2-Hanke (2017–19)) was carried out between 2017-2019 and it focused on integrating project partners, developing human resources and culture, launching integrated projects, and completing development phases. A total of eleven pilot projects with a combined value of over EUR 1 billion were initiated during IPD2.

The IPD3 project (IPT3-Hanke (2020-22)), which ran from 2020 to 2023, focused on project planning and production management, collaboration, subcontractor integration, and Lean management. A total of five pilot projects were launched, the most significant of which is Laakso Hospital, a joint project by Helsinki Metropolitan Area Hospital Properties and Helsinki City and the largest-ever alliance construction venture in Finland. The project is worth almost 1 billion euros.

The latest project, IPD4 (IPT4-Hanke (2022-25)), was launched in the autumn of 2022. It seeks to improve value creation in projects and services, achieve deeper partner integration, renew, and standardize modes of operation, and promote joint development in the sector. Achieving a systemic change in the industry calls for long-term efforts. Although the actual work is carried out in the development projects, the journey illustrating the execution of integrated projects across the entire Finnish construction industry gives a better idea of the overall developments.

Corporate development programs

The first corporate development project, LCIFIN1, was launched as early as 2010 (Figure 1). Its goal was to increase and broaden the understanding of Lean construction and its methods and tools.

The LCIFIN2 project started in 2013 focused on process development and standardization. Academic research played a major role in these group projects. The LCIFIN projects were followed by RAIN, a joint program to develop integration in the construction industry. RAIN1, the first project launched under the program, focused on production flow, integration capabilities, project system planning, and collaborative mechanisms. At the same time, the development cycle became faster. Hence, joint workshops were held monthly to share firsthand experiences from testing Lean construction methods in projects and to address common bottlenecks across the industry from a development perspective. The role of academic research was diminished.

RAIN2 launched in 2019 focused on themes such as expanding integration, management of cooperation, and production flow. Also, cooperation with the contracting entities' IPD project was intensified during RAIN2.

RAIN3, the latest project, was begun in the spring of 2022. RAIN3 and the contracting entities' IPD4 project were better integrated with more joint workshops, test projects, and seminars. The RAIN3 themes are integration of people, processes, and technology; flow; Lean management; as well as Lean and green transition.

With the execution of alliance and joint group projects, the general atmosphere in the Finnish real estate and construction sector has become more transparent, and this culture change has spilled over from pilot projects to other ventures. It was soon discovered in the course of the development programs, that cooperation can be effectively and profitably supported using the methods and tools offered by Lean philosophy. Lean is an increasingly common talking point in the construction industry, and Lean construction is frequently brought up in discussions concerning the development of the sector and building companies.

LCI Finland is the proponent of Lean philosophy in the construction industry. It has successfully launched and developed

joint LCI Days, the first of which was held in Helsinki in 2011. Since then, the event has grown from a gathering of some 80 people to a three-day event attracting around 400 participants.

What has been accomplished?

The Finnish construction industry has gained major benefits and made important progress on its Lean journey. Lean philosophy and tools have delivered tangible cost savings in projects and services and improved cost estimates, schedule adherence, quality, integration, and collaboration in construction projects. Additionally, it has increased the number of integrated projects. To date, Finland has seen over 100 integrated projects with a combined value of around EUR 10 billion (Vison Oy, 2021). The numbers are significant even by international standards: more integrated projects have been executed in Finland relative to the volume of the construction market than in any other country.

Several integrated projects have received well-deserved recognition and dozens of awards have been given for successful execution. Since 2021, half of the Construction Site of the Year Awards handed out by the Finnish Construction Magazine has been given to alliance projects (Construction Site Management, 2023). For example, in 2019, the award went to the New Heart 2025 hospital project in Kuopio, in 2020 to the renovation of the University of Helsinki main building (Helsingin Yliopiston Päärakennuksen Peruskorjaus Käynnistyy | Helsingin Yliopisto, n.d.) and 2021 to the T2 Alliance (extension to the Helsinki-Vantaa Airport). Additionally, integrated project executions have received recognition from the Association of Project Professionals Finland in the context of the Project of the Year and Extraordinary Project of the Year competitions (Projektiammattilaiset Ry, 2023).

Aside from awards at home, Finnish Lean construction has received praise in international comparison. In 2018, IPMA (International Project Management Association) selected the Tampere Shoreline Tunnel Alliance as the best project in the mega project division (Tampere Rantatunneli, 2022). Finnish hospital design and construction expertise has also been recognized in Europe in connection with the Integrated Design Hospital Alliance project (www.IHDA.fi) (Allison et al., 2018)

Lean construction, collaborative business models, and integrated execution have been closely studied in Finland since the concepts were introduced. As of 2010, numerous doctoral theses and more than 100 master's theses have been prepared on integrated project execution in this country.

Successful project execution is fundamental for integration planning. The experiences gained from IPD and RAIN development programs suggest that:

- The integration of human resources, processes, and technology should be planned and initiated by the contracting entities.
- All the key project partners should be involved as early as possible to harness their expertise and resources and induce commitment to common goals.
- Project partners should have a common earnings logic geared to common goals and risks and benefit sharing.
- Design solutions and execution concepts are perfected when the contracting entity, engineers, builders, subcontractors, and other stakeholders work together to ensure the feasibility of the individual solutions.
- Closer integration makes for better design and construction flow.
- Projects should focus on people management and management development as well as confidence building.

During the past two years, most progress has been made in the integration of the entire supply chain. A case in point is the 200,000 m² hospital project in Helsinki (Rakennamme Laakson Yhteissairaala, 2023), in which nineteen companies, including two contracting entities, committed to common goals and risk sharing through access to joint project records (Rakennamme Laakson Yhteissairaala, 2023). Themes highlighted in project management include the importance of project employees and the role of the supervisors in creating favorable working conditions for these value-generating employees. Project execution follows a one-day-Takt Production model, which calls for a full commitment on the part of the production personnel and all subcontractors.

However, commitment alone is not enough. Projects require continuous integration of people, processes, and technologies and further development stemming from the Lean principles. Laakso Hospital is a prime example of what has been achieved in Finland through long-term cooperation and the joint development efforts of contracting entities, companies, and educational institutions. The entire Finnish construction culture is undergoing a major transformation, which will enable the introduction of new industrial operating models and solutions and increase productivity across the industry (Figure 2).

A key role in this cultural change has been played by contracting entities that require continuous development and value for money. To achieve this, they also need to improve their performance and engage in an open dialogue with the entire construction industry.

Finland has succeeded in creating smooth and practical discussion and development forums that have shaped the whole industry. The key drivers contributing to this progress are collaboration and integration, confidence-building between the partners as well a deeper understanding and application of the Lean principles in construction. As a result, Lean and integrated project execution is already reflected in the strategies adopted by many companies and client organizations.



Figure .2 Change in construction culture from a project to an industry-wide level (IPD Development Program)

What's next?

The cultural change in the construction sector is unstoppable. What is to be expected in the future can be examined in terms of the following six principles of Lean construction.

Optimizing the whole is a goal best achieved through integrated project execution using models such as project alliances. The alliance model will become more common, but its commercial mechanisms for sharing risks and benefits will also be used in the so-called traditional fixed procurement methods and, more widely, throughout subcontracting chains. New tools and methods, such as those based on artificial intelligence, are constantly being developed to optimize the whole.

The ongoing dialogue on the generation of value will become more analytical and widespread. Better ways of launching projects will be standardized to create a common understanding of the achievable value and the key objectives to be attained in the projects. At the same time, new requirements, such as environmental and operational sustainability, will be highlighted in the determination of value.

Focus on flow will reduce project lead times and the harmful effects of construction. While the progress in learning and adopting new approaches to construction will be quite fast, the efforts to improve flow will be hampered by industry regulations and things like traditional contract terms. Data usage and information flows will create attractive new opportunities.

Removal of waste is the best known of all Lean principles and a highly tangible concept to those engaged in design and production. Construction will take a productivity leap when workers are involved in the systematic efforts to eliminate waste and when planning and production focus on smaller batch sizes. As a result, construction will change from project production to construction industry. The change will take place faster in products and processes, e.g., in housing production and transport corridor construction.

Continuous improvement is a manifestation of operational and organizational culture. An excellent culture of continuous improvement is already evident in individual projects. The capability of the entire industry will increase when this culture spreads from one project to another and from isolated projects to the management of entire project portfolios.

Respect for people constitutes the very foundation of all Lean management. Unfortunately, this is also the most difficult of all the Lean construction principles to implement. As it is, there is still a lot of divergence between organizational cultures. Change begins with all of us working in this sector. Respect for people is an excellent measurement of the progress made in the Lean journey and in achieving a systemic change in the construction industry. A lot of ground remains to be covered.

2. Summary

When it comes to learning, nothing beats first-hand experience. It is an expression widely used in Finland to describe the Lean journey. Several bold executives of contracting entities took the lead in piloting new collaborative procurement models together with service providers. This opened the door to the early integration of partners, common contract structures as well as risk and benefit sharing. Subsequently, progress has been driven by the adoption of Lean construction principles, methods, and tools. The example set by the contracting entities, integration, and Lean construction have been instrumental in enhancing customer value and efficiency and improving the response to changes in the operating environment.

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