LEADING WITH SYSTEMS INTEGRATION

This article explores the leadership aspects of systems integration (SI) and how SI supports program delivery.

Current program management capability has not kept pace with the demands of major railway and metro engineering programs. Bringing together the many pieces of the megaproject puzzle necessitates new thinking based on the systems approach.

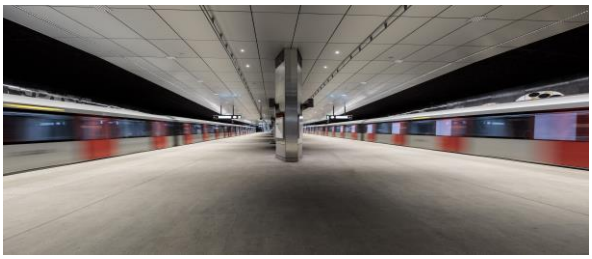
SI provides program leaders with practical methods for keeping the whole system in perspective and devolving leadership while still moving ceaselessly toward the end goal.

Effective SI

SI connects technical management with program delivery to produce outputs and tangible benefits—performance of the system, operational capability and revenue services for the end user. Combining SI with program management is an opportunity for leaders to bring together both the technical and scheduling sides of large-scale projects into a singular and aligned function to deliver desired outcomes.

The SI approach starts with planning, developing and visualizing the whole system to provide a structure for determining a set of program goals and requirements. Then, modelling, simulation, analysis and design define the system.

SI enables the client/owner to understand, through a high-quality system design, the whole system they will build and operate. Thus, putting SI in place early, in the pre-construction phase of the program, is critical. With pressure to rush into the building process, people involved in megaprojects often feel that SI is a process that can be skipped or descoped, for time and cost reasons. However, the risks of not integrating and applying SI are significant: producing a system that does not function or perform as intended, or, in extreme cases, a system that will not work at all.



Amsterdam North-South Line, Netherlands

Effective SI requires program leaders to think about their rail program through three different lenses:

Whole System

View the railway as one integrated technical system that delivers a unified output capability. Develop technology and engineering solutions that work across interfaces through all phases of the delivery lifecycle.

Whole Life

From the outset, think into the operations-and-maintenance phase of the railway, to ensure that decisions in the early lifecycle stages provide optimal and cost-effective end-user solutions.

Whole Network

Define how the railway program impacts and is integrated into the wider multimodal transport network and how the end-user benefits will eventually be realized.

Common Challenges

Complex engineering programs are among the most difficult of human endeavours—the sheer scale, fast pace at which they work, long time horizons, continuous organizational and political change, and the bewildering array of technical decisions. Such conditions make effective program delivery difficult for even the most seasoned leaders. Adding to these demanding factors, leaders and managers of engineering programs face the daunting task of moving toward delivery of results while grappling with technical, social, environmental and external political issues.

Against this highly complex backdrop, leaders face day-to-day challenges calling for immediate attention. Too often, unsolved in the moment, these challenges lead to a spiral of action that does not keep up with events. Here are just a couple of likely familiar experiences:

- Similar problems reoccur, maybe weeks or months after believing the initial problem has been solved. Thus, leaders and managers feel that they are unable to make long-term progress.

- Lack of certainty characterizes a range of decision-making toward program delivery—for example, completing a seemingly simple task such as fixing a schedule of dates or budgets or deciding how to procure a new technology to provide value for money and certainty of delivery.

The way to deal with these challenges is to tackle the root causes of complexity by establishing a well-considered, clear and complete systems framework.

Collaboration at the Core

Fostering deep collaboration across organizational boundaries through the discipline of SI should be a core part of the toolkit for effective leadership and management. Organizations that initiate major programs must manage layers of complex communication and action coordinated across a broad range of stakeholders and suppliers.

Often our clients are looking for a new approach to solve technical issues besieging their programs that are already underway and sometimes at the later stages of implementation. The root cause of these issues is seldom the technology alone; it is often the lack of human cohesion and communication around an early well-defined process.

That's why an upfront dialogue and continuous communication with key individuals and core stakeholders are essential to incrementally build a clear understanding of the challenge ahead and develop a common sense of purpose with the people involved.

SI recognizes that no one person has all the answers. Using SI tools and established processes naturally fosters a collaborative environment where a strong multidisciplinary team-based ethic can take hold. For example, when starting a program, a system architecture is needed to describe the technical elements of the end solution. Frequently forgotten, though, is the importance of the team process to create that system architecture, analyze it and make related technology decisions. The team process itself creates a shared understanding of the solution and how it can be designed, built and operated.

Willingness to change the way teams think and interact with each other is a prerequisite to applying a systems approach. Often, people are laser-focused on their own business function. SI requires people to first see the big picture and understand how their "piece of the puzzle" fits into and affects the program as a whole. As communication develops, new patterns of thinking emerge, evolving how the team tackles seemingly intractable problems. Program

leaders should thus be prepared for challenging conversations to bring about a holistic perspective and mindset.

Extending the Organization

SI by its nature needs to have distributed leadership across the organization. Creating the capacity for coordinated action between all parts of the extended organization—individuals, teams and contractors—is necessary for an integrated output. Bringing together the best knowledge by creating collaborative teams with suppliers and core stakeholders is essential from the outset. Ongoing expansion of team capacity and capability for integration is required as the program progresses through its lifecycle. The SI manager must continuously champion this process. When delivery is in full swing, with perhaps thousands of employees, it is vital that the SI strategy is understood and executed by all key leaders of the extended organization. The goal of collaboration is to build great teams that grow together through the program, retain and share knowledge, and learn to work as one truly effective unit.

Successful implementation of delegated decision-making requires teams of very high competence. To develop and set in motion a highly productive program management process, SI focuses on advancing the dynamics of people and the organization, enlisting stakeholder support and empowering decision-making throughout the organization.

A certain degree of governance, however, is needed. Contracts (such as for civil works, trains and railway systems) should be written to mandate the need for SI so that each supplier team is included in the SI process and has a clear responsibility to support achievement of the output goals. Integrating these individual supplier teams can be accomplished during the various phases of the program. This process starts with the creation of contracts that are designed to work together, with appropriate incentives for implementing SI, then writing system requirements that deliver the subsystem, manage the interfaces and enable the end goal.

Leadership Mindset: One Team, One Goal

Gaining the critical holistic system perspective can be difficult for today's leaders whose vantage point is limited by their immersion within the organization. The role of the systems integrator is a broad one that fills in the white space between parts of the organization, stitching together the pieces to deliver the system. In this role, the SI manager's communication and leadership skills are vital to the overall success of the program.

Creating alignment toward the overall goal is a particularly difficult integration task. The SI migration plan is an effective communication tool to create both alignment between all parties and a common vision of the journey to success—one team with one end goal.

Case Study: Amsterdam North-South Line

On the new Amsterdam Metro North-South Line, WSP applied precisely this approach(SI:D^3) to support the client to recover the program and enter a fully integrated system into revenue service. This program was a complex €3.1b extension to the Amsterdam metro of 10km (7km of tunnels), eight new stations (five of which are sub-surface) and implementation of modern railway systems technology to enable operations up to 16 trains per hour, providing the capacity to increase network ridership by 120,000 ppd (passengers per day).

At the start of WSP's engagement as an advisor, there was low confidence among the stakeholders, especially the operator, in the ability to meet overall program goals on time.

In this complex environment, where there were political as well as technical difficulties, an SI approach was selected as the method to help get the program back on track both internally and with stakeholders. Examples of the integration issues that were prevalent in this program were the lack of overall performance requirements, poor design coordination, contracts that were not aligned for integrated output, an SI team that did not have the organizational positioning to influence, and a governance approach that did not involve key stakeholders in problem solving.

Starting in 2015 and working through to the entry into service in 2018, WSP acted as the client's SI advisor—working directly with the key decision makers, regularly taking a health check of the program and providing clear and targeted recommendations to enable the program leadership team to develop their own organizational capability for delivering results in an integrated way. WSP used its SI:D^3 framework to review the program maturity and helped guide the program leadership team to a successful outcome.

WSP's SI:D^3 (**Systems Integration:** ***Develop*** the strategy, ***Define*** the system, ***Deliver*** integration) methodology, established over the last decade, deals with the challenges brought by increasing complexity in major rail programs and upgrades to railway infrastructure.

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Implementing an SI approach brings one solution to solve the myriad challenges faced by program leaders—both at the start of the megaproject and throughout the duration of the delivery process. SI allows program leaders to move away from the siloed thinking of current program management practice toward a holistic and thus more efficient and constructive way of tackling their challenges.

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