

Through-Life Systems Management –System Safety Through Life of a Railway System

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Background/Context

Safety of a railway system is about totality of the railway (people, systems, processes, tools, organisation, etc) from conception to design, build, commissioning, operation and maintenance, interventions, and eventually disposal. It is about considering everything that is part of or contributes to the above, within the organisation(s) running the railway systems and its environment.

The Through-Life Systems Management (TLSM) is an approach, developed in Jacobs, to integrate delivery and service capabilities to support our clients, most of which are railway operators, achieving maximum safety and security with optimal system performance, operability and maintainability. This approach not only considers the assurance of safety at any specific time, but also applies to the system over its lifecycle, during which various modes of operation such as normal, degraded, emergency, etc. are expected.

Due to the inherent complexity of a railway system, the changing environment, increasing demand from customers and overwhelming development of new technologies, effective management of railway safety faces continuous challenges, and systems thinking approach, through life of a system, becomes a necessity instead of a choice.

Objectives

The objective of the Through-Life Systems Management (TLSM) is to ensure the systematic and effective management of safety and security by dealing with the challenges faced by a railway system, without compromising its performance and services to the customers. TLSM is focused on:

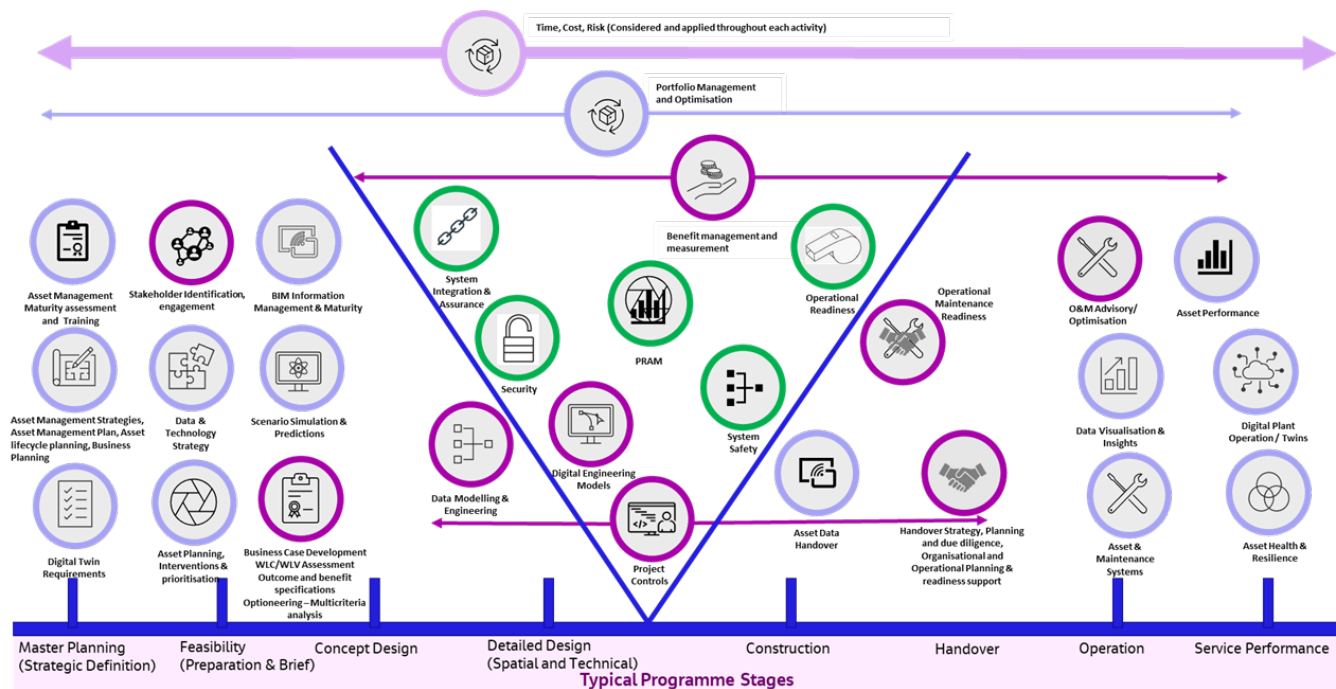
- Delivering OUTCOMES
- The WHOLE as opposed to the PARTS
- Managing THROUGH LIFE COSTS
- Managing RISKS and BENEFITS
- Providing sights of VALUES

Jacobs' TLSM framework manages the whole life cycle, including Master Planning, Feasibility Definition, Design, Construction, Operation and Maintenance, and Service (Renewals, Upgrades and Disposal), of a complex infrastructure such as the railway system.

The framework is productised ready to go or be tailored with the processes, products, tools and capabilities needed by the railway operators to deliver the system safety assurance products.

Methods/Approach

An overview of the framework is as below.



Some key features of the TLSM framework are briefed as below.

Efficiency - Modularised Approach

Each of the circles indicates a capability/process step needed to deliver an integrated solution required by the desired outcomes. For each of these, there are scalable process, guidance and good practice examples that can be adopted by or adjusted for a specific use. This modularised approach allows the productization of typical deliverables and creation of a library of readymade answers and enables significant efficiency in programme or project delivery.

Flexibility - Explicit Alignment with Typical System Lifecycle

In addition, the processes are explicitly identified and can be converted to an activity map and a delivery plan to specify the scoped, activities, deliverables, timeline, resources, costs, and responsibilities. This provides flexibility of its use in different types of programmes and projects of a railway system, but without losing the sight of how these programmes and projects interact with the existing system and other business needs.

Easy Adoption - Alignment with Other Business Management Activities

Considering that the safety of a railway system can only be effective and practical when it

is integrated with all other management systems, the processes are developed in a manner to facilitate the adoption of this framework by a railway operator.

Results/Findings

We have applied the approach to TransPennine Upgrade Programme in the UK with great results. Our approach has been commended by the Railway Safety and Standard Board (RSSB) and the Office of Rail and Road (ORR) in the UK.

The Systems Assurance Case has been produced on the basis of TLSM framework, in order to demonstrate the railway system meets its performance targets, is interoperable according to the Railways Interoperability Regulations (RIR) and is ready for safe, secure and reliable operation by the railway operator. In addition, the TLSM framework approach also defined the responsibilities and requirements that the railway operator need to take during the operation and maintenance phases of the railway. This helps the transfer of responsibility and knowledge from a design and build contractor to the ultimate user.

In terms of efficiency, the team delivering a programme level integration is around 10 times smaller than comparable team on a similar large scale railway programme and yet has managed to deliver timely assurance case for all 8 programme level milestones so far.

Conclusions

Outcome focused approach to delivery of safe integration through life of a system is an objective of the new framework (i.e. TLSM) developed by Jacobs.

The approach is proved to be able to efficiently deliver an optimized solution through application of systems thinking to through life management and operation of railway systems. Systematic approach of combining the key capabilities (systems thinking, asset management, digital, data, economics, etc) into a consistent, structured framework can enable detailed planning and engagement thus unlocking significant efficiencies and supporting achievement of milestones in time and to the budget.

Keywords

Systems, Safety, Security, Systems thinking, Through-Life Systems Management