UK West Coast Route Modernisation Project

From SEBoK
UK West Coast Route Modernisation Project

Lead Authors: *Tom Hilburn, Heidi Davidz, Alex Lee*, ***Contributing Authors:*** *Alice Squires, Richard Turner*

This example was created as a SE example directly for the SEBoK. It describes the United Kingdom West Coast Main Line railway project and some of the problems which occurred on this project before the implementation of SE. It also discussed the value of applying some aspects of SE, even if this is done later in the project.

This example is based on information from a report by the UK National Audit Office (NAO 2006). It also uses an INCOSE publication on systems engineering case studies (INCOSE 2011) to help structure its conclusions.

Contents

Description

The West Coast Main Line (WCML) is a principal United Kingdom (UK) railway artery serving London, the Midlands, the North West and Scotland. The Line is responsible for over 2,000 train movements each day, with more than 75 million rail journeys made each year on the route. It accounts for 43% of Britain's UK freight market (Railway People 2011). In 1998, the British government embarked on a modernization program called the West Coast Route Modernisation (WCRM) project, to carry out a significant volume of modernization work between 1998 and 2008, delivering increased capacity and reduced journey times as well as replacing worn-out parts of the railway. It was a challenging job involving 640 kilometers of track—much of which was incapable of carrying high-speed rail cars. Some sections were seriously dilapidated, and new trains would require a complete overhaul of signaling, power supply, and switching systems.

Early on, the WCRM upgrade had serious problems. A major complicating factor was the introduction of a new signaling technology that was designed to allow improved services for new trains running at 140 miles per hour. By 2001, neither the rail infrastructure upgrade nor the new trains were on course for delivery as expected in the 1998 agreement. By May 2002, the projection of the program's final cost had risen from £2.5 billion (in 1998) to £14.5 billion but had delivered

only a sixth of the original scope.

In January 2002, the UK Secretary of State instructed the Strategic Rail Authority (SRA) to intervene and find a way to renew and upgrade the WCML. An SRA analysis identified the following issues:

- The program lacked direction and leadership before 2002.
- The project did not have a delivery strategy and there was no central point for responsibility and communication.
- There was a lack of openness and communication regarding the program with interested parties before 2002 and there was a lack of stakeholder management.
- Scope changes arose because WCRM did not have an agreed-upon specification that matched required outputs with inputs.
- There was inadequate knowledge about the West Coast asset condition.
- Technology issues related to the decision to replace conventional signaling with unproven moving block signaling introduced major risk into deliverability and cost before 2002. These technology issues caused scope changes and program delay.
- Project management (PM) was weak, with a lack of senior management skills, too many changes in personnel, and ill-defined and fragmented roles and responsibilities. There was no integrated delivery plan and there was limited oversight of contractors. Poor management of contracts added to costs.

In order to remedy the situation, the SRA initiated the following actions, which align with generally accepted systems engineering (SE) practice:

- A clear direction for the project was developed and documented in the June 2003 West Coast Main Line Strategy, specifying desired goals and outcomes.
- A clear, measurable set of program outputs was established, along with more detailed infrastructure requirements, which were then subject to systematic change control and monitoring procedures fixing scope. Contractors were invited to tender complete detailed designs and deliver the work to a fixed price.
- Clear program governance structures were instituted.
- The SRA consulted widely with stakeholders and, in turn, kept stakeholders informed.

A National Audit Office (NAO) report concluded that the new arrangements worked well and that there were benefits to this approach (NAO 2006). Until this time, one of the program's key constraints and cost drivers had been the ability to access certain areas of the track. The new approach facilitated the ability to obtain possession of the track for engineering work, which was crucial to delivery. The new approach also enabled the program to identify opportunities to reduce the total cost by over £4 billion.

The NAO report also discussed a business case analysis by the SRA that identified the following benefits (NAO 2006):

- benefit:cost ratio for the enhancements element was 2.5:1;
- journey times and train frequencies exceeded the targets set out in the 2003 West Coast Strategy;
- growth in passenger numbers exceeded expectations (e.g., by 2005-06, following Phase 1 of the West Coast program, annual passenger journeys on Virgin West Coast grew by more than 20%); and
- punctuality improved (e.g., by September 2006, average time delays on Virgin West Coast trains have been approximately 9.5 minutes, a 43% improvement on the average delay of 17 minutes in September 2004).

The WCRM problems could be associated with a number of systems engineering concepts and practices: stakeholders requirements, planning, analysis of risks and challenges of new technology

and associated risk management, decision management, configuration or change management, information management, and management oversight.

Summary

The WCRM project illustrates that when SE concepts and practices are not used or applied properly, system development can experience debilitating problems. This project also demonstrates how such problems can be abated and reversed when SE principles and methods are applied.

References

Works Cited

INCOSE Transportation Working Group. *Systems Engineering in Transportation Projects: A Library of Case Studies*, version 1.0. Seattle, WA, USA: International Council on Systems Engineering. March 9th, 2011.

NAO. *The Modernisation of the West Coast Main Line, Report by the Comptroller and Auditor General*. London, UK: National Audit Office. November 22, 2006. HC 22 Session 2006-2007.

Railway People. '"West Coast Route Modernisation." RailwayPeople. 2011. Accessed July 25, 2011. Available at: http://www.railwaypeople.com/rail-projects/west-coast-route-modernisation-3.html.

Primary References

None.

Additional References

None.

< Previous Article | Parent Article | Next Article >
SEBoK v. 2.2, released 15 May 2020