

Project Management

Essay

Cross Rail Project (Elizabeth Line)

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The "Crossrail" initiative includes the construction of London's east-west Elizabeth line railway. This analysis will give a critical critique of the project in this essay. Ten additional stations, 42 kilometres of tunnels, as well as improvements to the surface railway, depots, and maintenance facilities, are all planned. The new line will boost train passenger capacity in central London and add £42 billion to the UK economy over the course of 60 years (Thomas, 2021). It will be built between 2008 and 2022 for a total cost of £15.8 billion. By adding 10% more capacity to the rail network, "Crossrail" reduces travel times around London, reduces crowding in the city's subway and train systems, and eases congestion.

After "Crossrail" is finished, 1.5 million more people will be within a 45-minute drive of London's major economic hubs. 200 million passengers are anticipated to use "Crossrail" each and every year. New twin-bore tunnels that span 21 kilometres beneath London will connect eight underground stations (Muruganandan et al., 2022). This route connects a number of business, commercial, and transportation centres above ground and underground across a radius of 118 kilometres. Most importantly, it will connect the City of London, Canary Wharf, and Heathrow Airport.

Delivering the project to TfL and the Department of Transport was the responsibility of "Crossrail" Ltd., a wholly owned subsidiary of Transport for London (Levar, 2022). It is supported by 40% of Transport for London and 60% of the United Kingdom Government. "Crossrail" received funding in the amount of 15.9 billion pounds in October 2007 (Doyle, 2022). In order to raise some of the 14.8 billion pounds that were allotted for financing after the Comprehensive Spending Review in October 2010, the "Crossrail" Business Rate Supplement, a tax that is exclusive to London, was put into place (Kerrigan, 2022). Additionally, tiny payments were made by businesses including Heathrow, the City of London, and the Canary Wharf Group that stand to gain immediately from the project. Additionally, developers involved in London's redevelopment projects paid a contribution by paying a specific tax. Due to finance in 2018, the project's cost increased to £15.4, but it is still less than the 2007 budget (Kumar, 2022). However, the price may increase once the work is done.

The organisation was administered as a privately held public enterprise, and its board of directors followed best practices from the private sector, according to Terry Morgan, the former chairman

of "Crossrail." The contractual arrangements necessary to deliver systems and infrastructure demonstrate the Elizabeth line design and construction project's high complexity (Cooper and Wright, 2022). In addition to 23 contracts for framework design, "Crossrail" Ltd. has issued 80 contracts for construction and logistics.

The risks involved in this challenging project in the middle of London are great. For the "Crossrail" project, the design-build approach was taken into consideration, which would have exposed the contractors to risk. It was not, however, accepted due to the lack of guarantee (Chodorowski, Ingram and Black, 2020). As an alternative, "Crossrail" decided to use construction management and conventional strategy that comprised bids for particular packages and complete designs for the important structures. When it comes to risk management and procurement, the corporation exercised considerable caution and used contingent fees. According to Malcolm Taylor, a spokesman for "Crossrail" Ltd., "almost all of our contracts were target-cost," and "we allowed the key infrastructure contractors three months so that they could optimise the design if they desired." Some of them changed the design to the project's advantage, such as switching from on-site in-situ concrete to precast concrete that was produced off-site (Bartholomew and Radhakrishnan, 2022). That type of contract, in his words, "allowed us to agree to revisions pretty rapidly with contractors, and we were compelled to work things out expeditiously as the project moved to the benefit of everyone."

Specialized committees were formed by the company and staffed by outside advisors. Expert groups provided feasibility and optimization recommendations to the project's engineers. Expert committees were used in the tunnelling, railroad, and procurement processes. For significant contracts, performance reviews had to be completed every six months (Anderson, 2022). The "Performance Assurance Framework" was in charge of assessment, encouraging teamwork, and information dissemination.

Not one, but two railways one virtual and the other actual were "constructed" by "Crossrail." Computer technology was used in the planning, construction, and operation of the railway (Thomas, 2021). The "executive level" took the decision very early on that "Crossrail" would be a digital rail, the first digital rail to be built in the UK, according to Terry Morgan, who was in charge of creating the "digital twin" concept.

"Crossrail" Ltd. set strict guidelines and compelled all contractors to utilise the business's own procedures and software systems in order to promote smooth collaboration and effective digitization of the new railway (Muruganandan et al., 2022). Every organisation wants to employ its very own software and internal processes when a project first begins. But obtaining pertinent data is both costly and dangerous. Due to the fact that these really large efforts are actually a series of projects, it is difficult from an information and data perspective to be prescriptive and try to explain what needs to be done to everyone. Clear norms and processes are required to offer consistency and clarity, says Malcolm Taylor, Head of Technical Information for "Crossrail" Ltd. "Especially when there are several designers and contracts requiring coordination."

One of the first significant initiatives to incorporate ecologically responsible decision-making into its operations was the "Crossrail" project. First came a strategy for long-term viability. This design was unveiled in 2009, the same year that works on Canary Wharf's Elizabeth Line started. Increased sustainability on all fronts, including the economy, environment, and society, was the aim of the comprehensive plan. It listed seven sustainability themes that complemented the objectives of the project's two sponsors, TfL and the Department for Transport, as well as a few extras like material sustainability that were crucial to the project (Levar, 2022). It also contained a few add-ons that were pertinent to the project. Sustainable development objectives were developed when it was possible. When there were no relevant benchmarks, the technique was to either define a target to see what could be accomplished or serve as benchmark information for subsequent initiatives or apply educated judgement to construct a nominal purpose. When there were no suitable benchmarks, the solution was to either develop a nominal target using informed judgement.

The project is expected to provide a net present value for the UK economy of 42 billion pounds over a period of sixty years. London will become a more competitive metropolis as traffic, travel times, and accessibility all improve (Kumar, 2022). Crossrail was the first large transportation project in the UK to simultaneously design the stations, surrounding neighbourhoods, and overarching growth prospects. Three million square feet of commercial, retail, and residential space are currently being built on top of or close to the new central stations, in addition to high-quality public space. Using this technology and master planning, regeneration throughout the

project route is optimised. In order to maximise the economic benefits to UK businesses, "Crossrail" actively collaborated with local suppliers and supported over 55000 employment in the UK during construction (Kerrigan, 2022). This was done by luring a wide range of possible bidders for the project. According to independent projections, the project will enable or hasten the supply of more than 90000 residences and more than 4.4 million square metres of commercial office and retail space (Doyle, 2022). London's real estate will increase in value by £10.6 billion as a result. "Crossrail" will also boost the availability of commercial office and retail space.

"Crossrail" complied with strict environmental regulations during the whole construction process. The construction of wetlands, recreational facilities, agricultural land, and industrial land accounted for 99.7% of the overall utilisation of the 8 million tonnes of material that was excavated. Particularly noteworthy is the effort done by the Royal Society for the Protection of Birds to enhance the natural reserve on Wallase Island in Essex (RSPB). Birds that migrate from Europe use the natural reserve. Eighty percent of this stuff was moved by rail and water, which decreased the number of trucks in London. 539499 tonnes was the total weight of building and demolition waste (Cooper and Wright, 2022). The 39% success rate exceeded the target of recycling or using 20% of the garbage. Construction equipment had emission controls over the required 80% level, for a total of 83%, in order to lessen air pollution (Chodorowski, Ingram and Black, 2020).

"Crossrail" and Network Rail calculated the number of biodiversity units related to habitats that were lost, degraded, or created as a result of the project using the biodiversity accounting method provided by DEFRA. The 42 kilometres of tunnels and 10 additional stations in the middle segment have a detrimental effect on wildlife. Green roofs and landscaping helped offset this loss to some extent. Currently, the initiative has succeeded in accomplishing 91% of the targeted biodiversity units as compared to 80% (Bartholomew and Radhakrishnan, 2022). Network Rail is concerned that the biodiversity along the surface route won't be lost. It is anticipated that the remaining 41% of the project will achieve the same goal of promoting biodiversity at local wildlife trust locations as the project is currently on target to do. When it comes to surface rail, the project is currently 59% finished (Anderson, 2022).

The project was effective in reducing its overall carbon footprint by reducing the use of operational railway energy, construction product embodied energy and construction energy. "Crossrail" succeeded in cutting carbon emissions from construction by 18.6% more than its target of 8% (Muruganandan et al., 2022). 'Crossrail' Ltd. created a system to determine the carbon emissions brought on by the machinery used by contractors. Contractors can choose the machinery they need to reach their carbon reduction objectives using the plan. By using cement alternatives when creating concrete, embodied carbon can be reduced. Despite the requirement for 50% cement replacements in the "Crossrail" concrete standard, some construction sites used 72%. "Crossrail" set weight and energy efficiency targets for trains. 350 unladen tonnes per 10-car train and 24-kilowatt hours per train were the targets. Per mile, there is 55 g of CO₂ (Thomas, 2021). Only a few tonnes shy of 319 tonnes, the unloaded weight exceeds the target. The lighter train helped to increase energy efficiency as a whole. Although tests on the train's effectiveness are still being done, the most recent data suggests that each train uses 14 kWh. The new trains are among the most energy-efficient in their class, emitting 32 grams of carbon dioxide per passenger kilometre.

LED lighting has been installed in tunnels and stations in an effort to reduce energy consumption by 62%. Complex lighting controls can help to maximise energy efficiency by using integrated electricity sub-meters in building management systems. In comparison to their normal equivalents, elevators and escalators in stations often utilise less energy (Levar, 2022). By switching to LED lighting, you can save money and reduce carbon dioxide emissions. LED lighting offers lighter, lower maintenance costs, and a decrease of 23,400 tonnes of CO₂. LED lighting and fixtures cost £1.7 million, however, they saved £19.9 million in energy costs, labour costs, material costs, and CO₂ emissions (Kumar, 2022).

Environmental responsibility is emphasised in most of the "Crossrail" elements. Old Oak Common, the project's main maintenance station, will use a cutting-edge renewable energy system for more than 30% of its energy needs (Kerrigan, 2022). The hybrid renewable energy system incorporates ground source heating and cooling to control the temperature of the main depot building using a combination of energy piles and 150-meter-deep boreholes. Three different thermal technology kinds combine to create this one-of-a-kind system, which is a

completely unique piece of machinery. It is the first UK railway depot to fully integrate its technology, which reduced operating costs and CO2 emissions by 35% (Doyle, 2022).

The "Crossrail" project used the Civil Engineering Environmental Quality (CEEQUAL) and Building Research Establishment Environmental Assessment Methodology (BREEAM) schemes to ensure and assess the level of sustainability performance attained by each project component (Cooper and Wright, 2022).

Because "Crossrail" affects the train system's capacity in London, the city as a whole should be considered while evaluating the economic benefits. The employment possibilities that will be created during construction and operation, as well as the time savings that will be provided to millions of people as a result of enhanced transport connections, will be beneficial to London's economy and competitiveness (Chodorowski, Ingram and Black, 2020). Terry Morgan thinks that the Treasury's projection, which calls for a total of 42 billion pounds over a sixty-year period, is a bit conservative. To ascertain the project's expected economic impact by 2020, "Crossrail" Ltd. commissioned an independent review in 2012 (Bartholomew and Radhakrishnan, 2022). The results showed that GDP increased by 5.5 billion pounds. The plan gained the trust of the developers, which benefited the regeneration initiatives. By 2020, the GDP was expected to increase by £11 billion, according to the same analysis from 2017.

Because "Crossrail," TfL, and local governments have funded the designs and public space restorations around stations, the redevelopment plans will be advantageous to London. Three million square feet of upscale commercial, retail, and residential space will start to be built over or close to the new central stations (Thomas, 2021). Twelve distinct real estate projects are expected to raise a combined £500 million for "Crossrail," which will save the general public money. Independent analysts forecast that the project will release or speed up the supply of more than 90000 residential units, more than 4.4 million square metres of commercial office and retail space, and more than 4.4 million square metres of residential space, adding an additional £10.6 billion to the value of the real estate in London (Anderson, 2022).

"Crossrail" differs from earlier megaprojects by emphasising innovation and sustainable practises from the beginning. Buildings with innovative and sustainable features have lower construction and maintenance costs, but it can be challenging to quantify these advantages.

The new Elizabeth Line, also referred to as "Crossrail," will benefit London and the UK economically and environmentally (Kumar, 2022). If the project is able to both ease traffic on London's transportation system and generates new jobs, a compelling commercial case for the entire city of London may be presented (Levar, 2022). The UK economy will benefit by at least £42 billion thanks to the new railway, which will cost £16 billion to build. Megaprojects shun risky and expensive sustainable or innovative technologies frequently, as seen in "Crossrail." The "Crossrail" project was a pioneer in terms of creativity and sustainability in large-scale construction, on the other hand, and was the "correct project" and "done excellently." Environmental friendliness is guaranteed in every part of the project thanks to BREEAM and CEEQUAL ratings (Muruganandan et al., 2022). As is obvious, the project's size makes it difficult to be both innovative and sustainable. The Innovate 18 programme shows how large-scale initiatives have the potential to innovate and why a programme like this needs to be put in place as soon as possible for the most advantages (Kerrigan, 2022). Waste and operating costs were reduced at the "Crossrail"-Bentley Academy thanks to the "digital twin" method and creative engineering design. The Academy advises production companies to blend their efforts in design and building with those devoted to operations and technology. Establishing a precedent for combining physical and digital models and harmonising standards and procedures, sets the way for future infrastructure initiatives. This will probably end up becoming the norm for all future construction projects. Bentley is creating a global network of academies to support initiatives and disseminate knowledge gained from earlier projects, particularly the signalling difficulties faced with "Crossrail."

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