Railways Always – Infrastructure Development with VE
(Transportation case study)

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The importance of the subject matter

Sourcing from its geographical position, Hungary is considered to be the key in providing and developing the traffic routes of west-eastern and north-southern directions.

Corridor IV, in which the urban railway station subject to the implementation of the reconstruction is located between the Pan-European corridors as indicated to be subject to significant development by the European Union. Therefore, it is highly important to

have such railway station in the railway corridor also carrying international traffic that can serve well the traffic stopping, changing and going through.

Figure 1 – Railway corridor categories in the Hungarian railway network

The reconstruction of a similarly important railway station costs 300-400 million USD. Therefore, it is important that the country can implement functionally appropriate, while cost saving reconstructions thereof.

The topic

The topic covers the reconstruction of a railways station managing passing through passenger and freight traffic as well as stopping and changing passenger traffic. The Value Engineering work was commissioned by the Ministry of National Development.

Figure 2 – Benchmark images (Train examples)

Introduction of the environment

The global objective is that also the modernization of the railway stations becomes implemented along the international railway corridors. The trains are aimed to be able to run at minimum 160 km/h speed constantly. The modernization should be implemented in the indicated railway stations. Besides, the stations are to be equipped with appropriate basis for maintenance and washing facilities. For the complete railways corridor, the reconstruction works have been progressing intensively and have already been completed to an excessive extent. The station subject to the project, due to the high financing needs, still waits for a final decision and implementation to be completed. This is because of the fact that the support can be applied for from the EU CEF sources, however, it does not mean it is available for everything without limitations. There are modern railway stations even including such stations that were built in the last century. These, with continuous modernization, can be integrated in the modern railway network.

What is the CEF?

The Connecting Europe Facility (CEF) is a key EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. CEF investments fill the missing links in Europe's energy, transport and digital backbone.

The CEF benefits people across all Member States, as it makes travel easier and more sustainable, it enhances Europe’s energy security while enabling wider use of renewable, and it facilitates cross-border interaction between public administrations, businesses and citizens.

In addition to grants, the CEF offers financial support to projects through innovative financial instruments such as guarantees and project bonds. These instruments create significant leverage in their use of EU budget and act as a catalyst to attract further funding from the private sector and other public sector actors.

Project objectives

Long term objective:

Creating a situation, by which the subject investment becomes possible to be implemented.

The main objectives are given as being sourced from the exaggerated needs indicated in the implementation plans. I./ - Dropping the costs of the project; II./ - Qualification of the needs; III./ - Sorting out the outperformed elements.

Target parameter is: minimum 5-10% cost cutting to be reached so that the value is increased in the project.

From the technical point of view, the scopes of the value assessment are the same as the end points of the implementation plans.

Definition of the problem

Railway development in Hungary has its own characteristic, special process. The point is that any planning company will carry out planning based on the needs of the subject railway organization. The designer's performance is generally confirmed by the leader of the subject railway organization who is the same as the one who informs the designer about the needs.

As a result, the designer endeavors to meet the needs of the railway organization to the maximum in order to have his/her own performance confirmed. Sourcing from that, the individual plans carry significantly over-dimensioned elements. The implementation of the over-dimensioned elements is not supported by either the European Union or the Hungarian Government.

Current status

The railway station subject to the project has not been renewed since the middle of the 70's. Referring to the lack of financial sources, continuous maintenance and renovation works have been quit. As a result, the railway station is in a very poor condition. During the renovations in the 70's, an increasing freight and passenger traffic was projected.

Therefore, numerous railway tracks were built, which by today, have become significantly under-utilized.

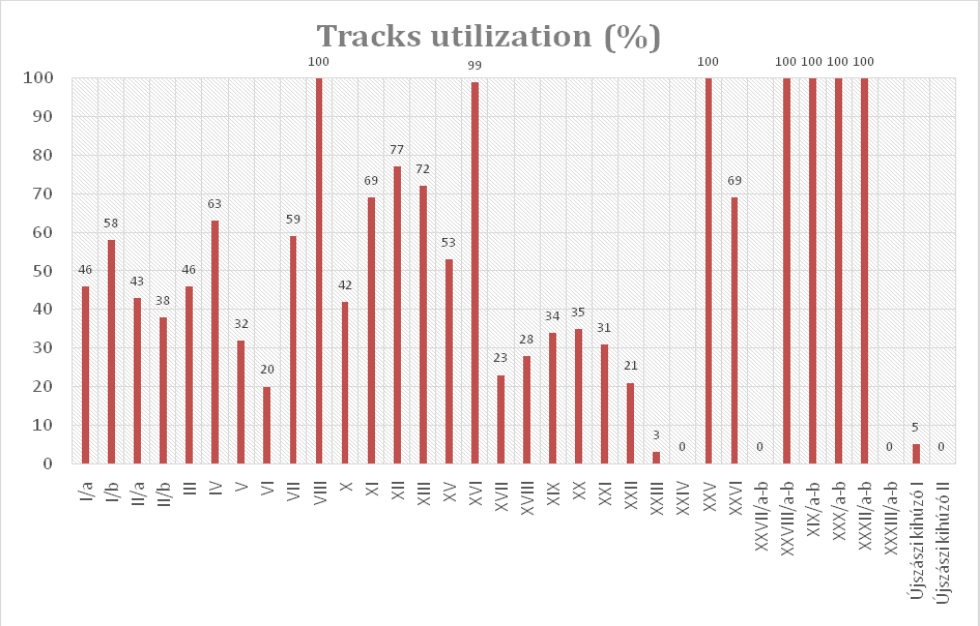

Figure 3 – Tracks utilization

The station is located in an architecture-award winning building and several listed buildings are to be found on the site of the railway station, all of which are also in poor conditions. Therefore, sourcing from the style of the urban railway station, the Value Engineering team faced a special situation because an important railway junction with special buildings was to be assessed. Despite of all that developments are necessary due to the poor state and inappropriate operation conditions. Travelling habits have also changed in Hungary, the pattern of travelling moved from travelling by rail to long distance bus services and individual passenger cars.

Dilemmas

Railway experts, having the Vienna (Austria) railway station as the basis communicated their needs to the designers. The subject town only manages 15,000 passengers traffic and cannot be compared to the Vienna railway station in terms of freight traffic either. It was obvious for the Value Engineering team that any cutting of the content compared to the content of the plans would provoke strong emotions from a smaller group of stakeholders.

The subject of the assessment

The team worked with close consideration of the implementation plans as the basis of the assessment. The plan was very complex and manifold. The total of 1824 files was available forming a several thousand pages. Parts of the project:

Electric conduits: Overhead conduit, railway switches heating, pre-heating, transformers, Overhead line energy remote control.

Railway telecommunication: Safety equipment, safety technology.

Railway station: Passenger traffic railway station, operations station.

Civil engineering: Railway station, Technical building, Safety technology building, Maintenance building, train-announcing points, Loading buildings, Transformer houses, Platforms, Warehouses, Maintenance hall, Train washing facility.

Road construction: P+R parking and connected traffic facilities, “MÁV” (Hungarian National Railways Co.) employees parking and connected facilities, operations station fire fighting and service roads, other buildings, internal traffic facilities, road crossing, dust road.

Bridges, objects: signal bridges, passenger underpasses, baggage underpasses, overpasses, shafts.

Small objects, water management, water supply, gas supply, environmental protection, environment management, telecommunications, lighting.

Functional costs, functional assessment

During the functional assessment, the team examined 224 functions and based on the functional parameter assessment, the team formed the following statements:

- The number of railway tracks is oversized.

- Besides the stairs, two pairs of escalators + lift lead to the platform. This in their parameters is oversized. The capacity of the escalator of the service station serving 15,000 passengers is 6,500 persons/hour! The escalators can only fit the platforms if the platforms are extended in their width and the railway tracks are relocated.

- However, 60% of passenger traffic on the three platforms is managed n 6 tracks and the coverage of the platforms were planned in a hall-like structure, where 16 tracks were projected to be covered by a common cupola.

- The length of the proposed maintenance hall is 250 m, while a railway assembly is only 100-150 m long. Functional cost assessment has also been carried out.

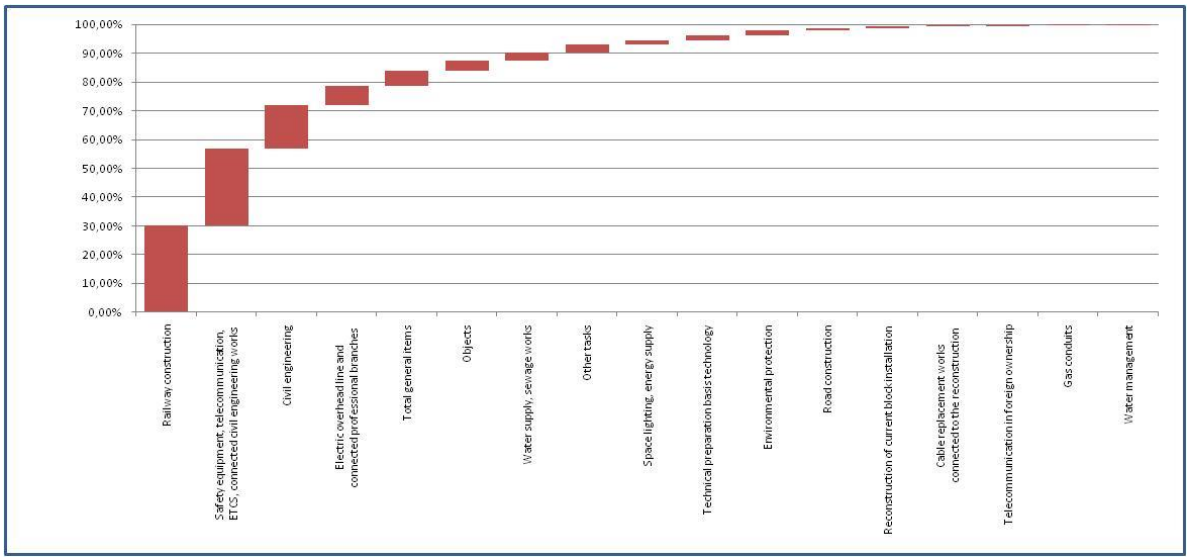

Figure 4 – Clusters of the cost analysis

In the subject case, the percentage rate of three cost groups shows an outstanding portion in balance of the rest of the cost elements. Calculating with cumulated costs, it gives 72.04% of the total project cost.

It was also stated that a significant portion of the civil engineering works (over 81%) is to be used on 4 building elements. These include the civil engineering works of the maintenance hall, platform covers, reception building and washing hall.

New solutions, new bases

The team gathered ideas for the critical functions, the total of 128. The raised ideas placed the plans on a completely new platform, which became the following, e.g.:

- Avoiding the reconstruction of the passenger railway station tracks by optimizing and modification of the access to the platform. - Decreasing the lead time of the project implementation. - Switch heating, energy supply, assembly pre-heating optimization. -

Building used materials in the maintenance tracks. - Optimization of the maintenance basis. - Scheduling of the renewal of tracks.

Results

Number of proposals: 16. Total cost saving (million USD): 101.1

Project size (million USD): 328.2; Extent of cost saving (%): 30.8

By the scheduling of the project and the functional modification of the individual elements, the time needed for the implementation dropped from 6 to 3 years.

The value increment

As the result of the project, the reconstruction is feasible and financeable. The optimization of the exaggerated needs indicated in the implementation plans has been carried out. Value increment has been realized through the following:

- Based on the proposals, the lead time of implementation was decreased by 50%. Passenger traffic shall be loaded for a shorter time; therefore, there is no need for building a new station for the temporary period.

- With the help of reviewing the functional parameters, the costs could be significantly decreased by leaving the over sizing of certain elements. (e.g. number of railway tracks, number of covered platforms, length of maintenance halls).

Major conclusions

Over sizing experienced as the result of planning was a splendid platform for the Value Engineering. The decision makers' (Ministry of National Development) support significantly motivates the members of the Value Engineering team.

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