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Rail infrastructure management applying controlling based decision-making systems

Results of the Ph.D. dissertation

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1. History and actuality of the research topic

Nowadays the structure and operational system of the rail transport sector is changing significantly. Rail liberalization has arrived. The legal and the technological framework of the liberalization is already worked out in detail and the development and the opening of the rail markets are in an advanced phase. At the same time the financial situation of the rail companies including rail infrastructure management has still not been arranged.

Rail infrastructure has a significant role in the whole transport network, so most of the European countries started a strong development and reforms. The structure reforms and the liberalization of the railways have been going on in Europe for almost two decades with more or less success. The final aim is to construct a uniform rail market considering the legal, the economic and the technological aspects.
At the same time rail infrastructure managers and governments have to face the fact that in spite of several innovations they have not been able to cope with the decreasing competitiveness in the last years.

Rail infrastructure management is a vital point of the rail liberalization but it was treated only marginally because of several difficulties. Hence its reform shows some deficiencies. Therefore it is inevitable to analyze the rail infrastructure management also from a costing point of view. It requires the application of new controlling and cost calculation methods with corresponding adaptations for the specific characteristics of rail infrastructure.

The Hungarian rail infrastructure manager would like to renew its lately used, outdated financial and accounting system because the foregoing corrections have not brought about complete success. Implementation of this methodology gives better transparency of the costs of rail infrastructure management and the planning of costs and rail charges of services will be placed on a new and more precise basis by using accurate allocation procedures. Last but not least this methodology may increase the competitiveness of the whole rail transport sector too.

Chris Nash is a renowned researcher, who defined the rail infrastructure charges for incumbent rail companies. Dr. Gyula Farkas and Dr. Lászlóné Tánczos worked out the topic of rail infrastructure services. Dr. Attila Rixer and Dr. Gyula Farkas wrote publications about the tasks of the Hungarian rail companies in connection with the EU-integration and law harmonization. Dr. Zoltán Bokor dealed with the information and controlling systems of the rail infrastructure management in an activity based costing point of view. Dr. Péter Rónai worked out the application of the marginal cost theory for rail transport. Dr. Ágnes Dénesfalvy determinde the quality parameters for the rail infrastructure services at the stations. Dr. László Kormányos elaborated the whole service system for the rail passenger transport.

2. Objectives

The aim of the dissertation is to clarify the costing system of rail infrastructure management. In light of what has been explained above, the challenge of the work is to develop a new cost calculation mechanism based on recently used cost calculation methods. The specific aim of the study is to create a complete cost calculation method for rail infrastructure management including an extensive process and activity analysis and cost driver selection. On the basis of this methodology a new cost model will be developed to identify costs of rail infrastructure services. Using this model results in more accurate cost identification by selecting proper cost drivers with better defined rail activities on the one hand while costs based on more exact calculations can lead to more realistic determination of the user charges on the other hand.

Those aims have to be formulated, which are indispensable from the aspect of the developed model. Two main aims can be identified. The first major target is to define the overhead costs of the rail infrastructure management in the interest of a more exact cost identification of the produced rail infrastructure services so that the rail charges can reflect the real expenditures and costs. The second is the determination of more exact cost-drivers (demand of capacity, basis of real rail performance).

Besides, several decision-making sub-aims can also be determined:

- Reconsidering and reengineering the business processes of the rail infrastructure
- Finding critical points and bottlenecks in the previously mentioned processes (for instance: lack or overflow of capacity, lack of financial sources, education of rail staff)
- Discovering the redundant procedures (for instance in assets management, transport of special goods, estate management and maintenance)
- Determining dead capacities and make their costs visible (buildings, tracks, etc.)
- Giving precise definitions of the rail activities joining the processes
- Eliminating needless activities (paper administration), entering new activities or the extension of the current activities (controlling processes)

The dissertation gives recommendations in order to make the cost collection system of the rail infrastructure management more effective, through using operative and strategic controlling methods. The aim is to define the overhead cost of each rail infrastructure services, which can support the decision-making for the professional and the senior management. Furthermore in the case of rail infrastructure services with costs higher than the market prices reflect less effective processes.

3. Methodology

For realizing the main aims of the research I analyzed the cost collection system of the Hungarian rail infrastructure manager, through studying the international and Hungarian legal background.

After that I analyzed the activity code system used at the rail infrastructure manager. I identified and grouped the rail infrastructure activities and evaluated the rail cost calculations system.

For adaption, developing and working out a new methodology, I analyzed the main cost calculation methods. Evaluating the standard costing, activity based costing (ABC) and value stream costing (VSC) helped me to find proper methodologies for rail infrastructure management.

Having analyzed the activity based costing it became clear that it is a adequate method for supporting rail incumbent companies.

Furthermore I analyzed the methodology and adaptation opportunities of value stream costing. I demonstrated how value steam costing and activity based costing can be combined in a new integrated, complex methodology.

I formulated a hierarchical target system for working out the new methodology. Keeping in mind these aims, I developed a new rail cost calculation method and a mathematical model supporting the overhead cost calculation of the rail infrastructure services.

I provided a more exact basis for calculating the rail infrastructure cost with the new cost calculation method. Furthermore, with the help of the value stream analizing, I identified the value creation processes of the rail infrastructure manager. The methodology gives an opportunity for optimizing the rail activities within the value streams which can increase the cost efficiency.

Regarding the rail charging system based on rail infrastructure costs, I worked out a more reliable cost calculation methodology, which can clarify the overhead costs of each rail infrastructure service and creates the possibility for forming more just rail infrastructure charges.

4. New scientific results

1. Critically analyzing the cost collection system of the Hungarian rail infrastructure manager I identified the deficiencies. With the help of that I verified the requirements for developing the new cost calculation methodology. [Hok2009c], [Hok2011b] I determined that after proper adaptation of the activity based and value stream costing, the new intergrated cost calculation methodology can be efficiently applied for the system-wide development of cost calculation for rail infrastructure management. I identified the main calculation principles, which are needed for working out and applying the new methodology. [Hok2009a], [Hok2011a]

I identified the two main problems, which has to be managed in the current and the new methodology:

- the not proper structure of the cost aggregation and allocation from the operational point of view
- the distorting effect of the current system regarding the overhead cost calculation and the rail charging system

The structure of the company and activities causes the complexity of the cost calculation. I determined that the numerous cost aggregations and allocations introduces an inaccuracy and distortion in the cost collection system. The varied number of performance indicators do not display the real relation between the resource use of the rail infrastructure services and their costs.

I pointed that the high level of the cost aggregation and the allocations result in an inaccurate structure of the rail infrastructure services. According to the former analysis, the current cost collection and allocation mechanism needs to be reconsidered and redeveloped.

The size of company, the organizational structure, the nature of business and information systems influence the applicable cost calculation methods. The endeavour to form an independent rail infrastructure manager company strongly influences the scope of cost calculation methodologies which are appropriate for effective operation.

Activity based costing (ABC) is applicable for rail cost calculation. The currently used activity code system can help implement this method. The ABC has a deficiency, in as much as it focuses only on the adequate allocation of the costs for selecting several cost-drivers. But it can not find the unnecessary processes and their costs, which is an important aim of the dissertation. So on the one hand I suggested to develop the methodology in a time based way. The previous statements I verified through analizing the rail infrastructure processes. On the other hand I analized other cost calculation methods.

The value stream costing (VSC) structures the processes in a new way. It identifies the important value creation processes of the rail infrastructure and increases the direct costs, which is one of the main aims of the dissertation. Further advantage of the VSC is, that it can find the unnecessary and wasteful processes. Consequently, I verified that the VSC and ABC are applicable in a combined way for supporting rail infrastructure management.

2. I worked out a hierarchical value stream and process structure to support the whole rail infrastructure management. [Hok2013]

I identified and worked out the steps of the new hierarchical, rail value stream costing (Figure 1.):

- Determination of the main rail infrastructure value streams and determination of the supporting value streams.
- Identifying the rail activities within the value streams.
- Determining the planned costs of rail activities.

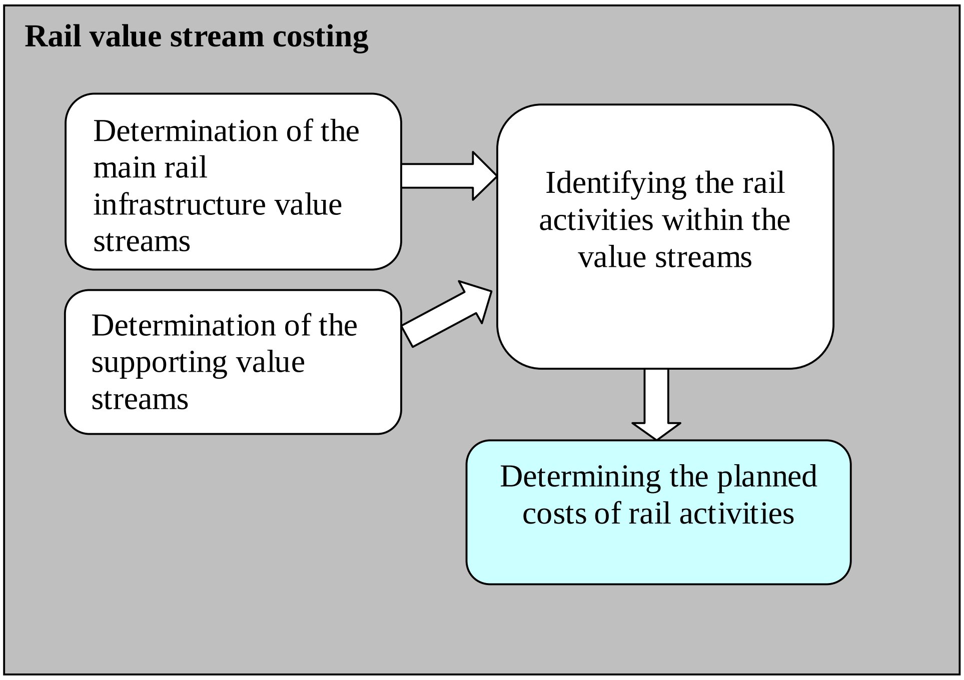

Figure 1.: The main steps of the rail value stream costing

I defined each level of the value stream hierarchy and within the levels the activity chains (Table 1.). I identified four main value stream levels:

- Main value streams.
- Primary supporting value streams.
- Secondary supporting value streams.
- Tercier supporting value streams.

The sequence of the value stream levels points to the hierarchical structure. By defining the structure I aspired that each level can be clearly separated from each other and the processes can be identified.

The current process structure of the rail infrastructure manager focuses mainly on the internal organizational processes and activities. In contrast with this, the new value stream structure adjusts to the outputs of the rail infrastructure, so it joins the production processes of the rail infrastructure services. The methodology can describe the rail technlogical processes. It was a very important aim of value stream structure that more and more activities can be classified for the main value streams. Only this ranking can ensure, that the largest part of the costs is allocated directly to the rail infrasturcture services.

Value stream main group	**Value stream group**	**Name of the value stream**	**The main rail activity chains and their costs within the values streams (operational, maintanance, renewal, amortisation)**
Main value streams		Value stream of the rail infrastructure provision available	Up- and substructures at track line
			Main tracks, their swithes and their up- and substructures at stations
			Tracks for train recivings, their swithes and their up- and substructures at stations
			Side tracks, their swithes and their up- and substructures at stations
			Tracks, their swithes and their up- and substructures at stations with private usage
			Marshalling yards and humps, their swithes and their up- and substructures at stations
			Personnel needs for the rail infrastructure
		Value stream of the rail bulidings	Rail bulidings at track lines
			Passenger service buildings and facilities at stations
			Passenger cabins and platforms at stations
			Industrial and other buildings at stations
			Personnel needs for the rail bulidings
		Value stream of the rail facilities	Railroad maintenance workshops and facilities
			Pre-heating and pre-cooling units
			Petrol filling equipmnets and fuels
			Water filling equipments
			Toilet drain equipments
			Rail weighbridges and their equipments
			Axis transmission equipments
			Personnel needs for the rail facilities
		Value stream of the overhead line system	Overhead line system
			Personnel needs for overhead line system
		Value stream of rail traffic control (services)	Rail traffic control systems (services)
			Signalling and interlocking (services)
			Personnel needs for rail traffic control (services)
Supporting value streams	Primary supporting value streams	Value stream of primary rail information systems	Informations and its system needs for the rail infastructure
			Informations and its system needs for the rail bulidings
			Informations and its system needs for the rail facilities
			Informations and its system needs for overhead line system
			Informations and its system needs for rail traffic control (services and sustainment)
			Personnel needs for information services

Value stream main group	**Value stream group**	**Name of the value stream**	**The main rail activity chains and their costs within the values streams (operational, maintanance, renewal, amortisation)**
		Value stream of rail traffic control (sustainment)	Rail traffic control systems (sustainment)
			Signalling and interlocking (sustainment)
			Personnel needs for rail traffic control (sustainment)
	Secondary supporting value streams	Values stream of supporting services	Accounting, finance and controlling processes
			Development, invesment and logistics processes
			Real estate management processes
			Rail security processes
			Informations and its system needs for supporting services
			Personnel needs for supporting services
	Tercier supporting value streams	Value stream of management processes	Rail infrastructure management processes
			Site management processes
			Rail node management processes
			Track and engineering section management processes
			Quality management and assurance processes
			Marketing processes
			Human services
			Communication processes
			Legal processes
			Internal control processes
			Informations and its system needs for the management processes
			Personnel needs for the management processes

Table 1.: The hierarchy of the rail infrastructure value streams and their main activity chains

3. I worked out a new, rail activity level cost collection methodology for identifying the cost structure of the rail infrastructure processes in a more detailed and accurate way. [Hok2009b] Furthermore I defined a new accounting dimension, the multi-level rail infrastructure cost code system, which can identify the elemental units of the activity chains within the value streams. [Hok2013]

The methodology collects the costs at the level of the elemental activities. For that I defined the four main steps of the rail activity level cost collection (Figure 2.):

- Definition of the cost objects (multi-level rail infrastructure cost codes)
- Setting up the rail activity hierarchy
- Assigning the costs to the cost objects
- Setting up the rail infrastructure cost hierarchy

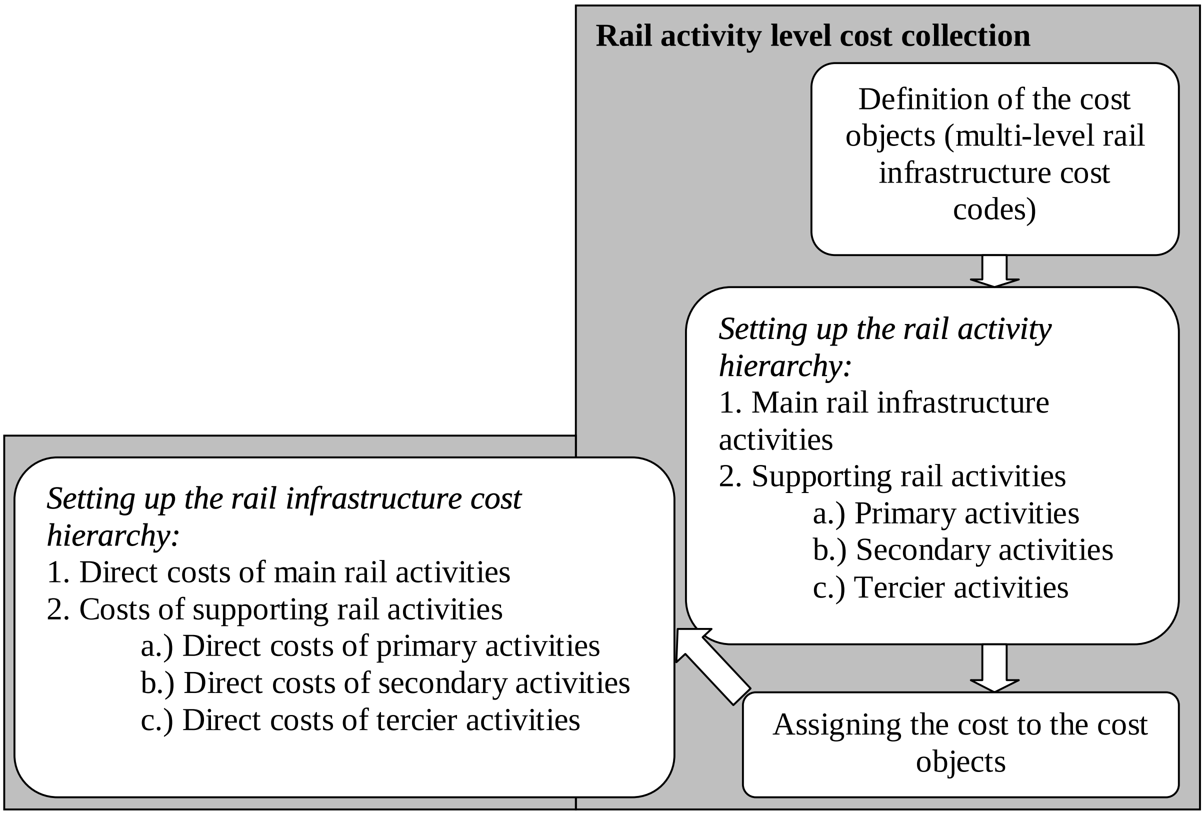

Figure 2.: Steps of the rail activity level cost collection

I worked out the steps of the cost collection, and also an activity and cost structure and hierarchy for the rail activity cost collection. The main activties and the cost objects are adjusted for the activity chains of the value stream hierarchy.

I defined a new accounting dimension, the multi-level rail infrastructure cost code system for supporting the rail activity based cost collection methodology, whose codes are based on six digits. The first three represent the codes of the value stream calculation levels, the other three identifies the elemental activities within the value streams (Table 2.).

Value stream calculation level	Multi-level cost code group
Up- and substructures at track line	111000-111999
Main tracks, their swithes and their up- and substructures at stations	112000-112999
Tracks for train recivings, their swithes and their up- and substructures at stations	113000-113999
Side tracks, their swithes and their up- and substructures at stations	114000-114999
Tracks, their swithes and their up- and substructures at stations with private usage	115000-115999
Marshalling yards and humps, their swithes and their up- and substructures at stations	116000-116999
Personnel needs for the rail infrastructure	117000-117999
Rail bulidings at track lines	121000-121999
Passenger service buildings and facilities at stations	122000-122999

Table 2.: The multi-level rail infrastructure cost code groups belongings to the the value stream calculation levels (detail)

4. I worked out a four level, hierarchical cost calculation methodology, which defines more precisely the overhead costs of the rail infrastructure services by dividing all costs of the rail infrastructure manager. [Hok2013] Furthermore I worked out a cost-driver search procedure, which can define the proper cost-drivers for the cost allocations of the calculation levels. [Hok2011b] I built up a time registration system, where the time period of the rail infrastructure activities can be recorded. [Hok2011c]

The input of the cost calculation methodology is the actual cost of the main rail infrastructure activities derived from the rail activity cost collection method. I allocate the costs through these four calculation levels (three support levels and one main rail infrastructure calculation level) and finally the costs of the main infrastructure calculation levels (direct and allocated costs too) are assigned to the rail infastructure services.

I identified that the critical point of the methodology is the selection of the proper cost-drivers. Therefore I worked out a cost-driver search procedure (Figure 3.). It can define the proper cost-drivers for the cost allocations of the calculation levels.

The cost calculaton methodology has three parts. In the first part, I assign the performance data of the time registration system to activity groups (on the supporting and main levels as well). Several performance data can belong to each activity group. In that case, in the second part of method, I do a ranking for this performance data, according to the features of this activity group. I choose the best correlated performance indicators. In the second part I form the cost-drivers (at supporting levels: primary, secondary and tercier activity drivers, at main level: rail performance drivers) codes from the selected indicators.

I defined the rail infrastructure cost calculations levels according to the value stream structure: main level, primary, secondary and tercier supporting levels (Figure 4.). For each cost calculaton level I identified the cost-driver structure and its cost-driver groups:

- Rail performance drivers: for the direct allocations the costs of the main rail infrastructure activties to the rail infrastructure services.
- Primary, secondary and tercier activity drivers: for the indirect allocations the costs of the supporting activities to the main rail infrastructure activities.

I worked out a time registration system, to collect the data and performance indicators of the cost-drivers, based on the time period. I realized a data collection on every place of duty and at all supporting and management levels.

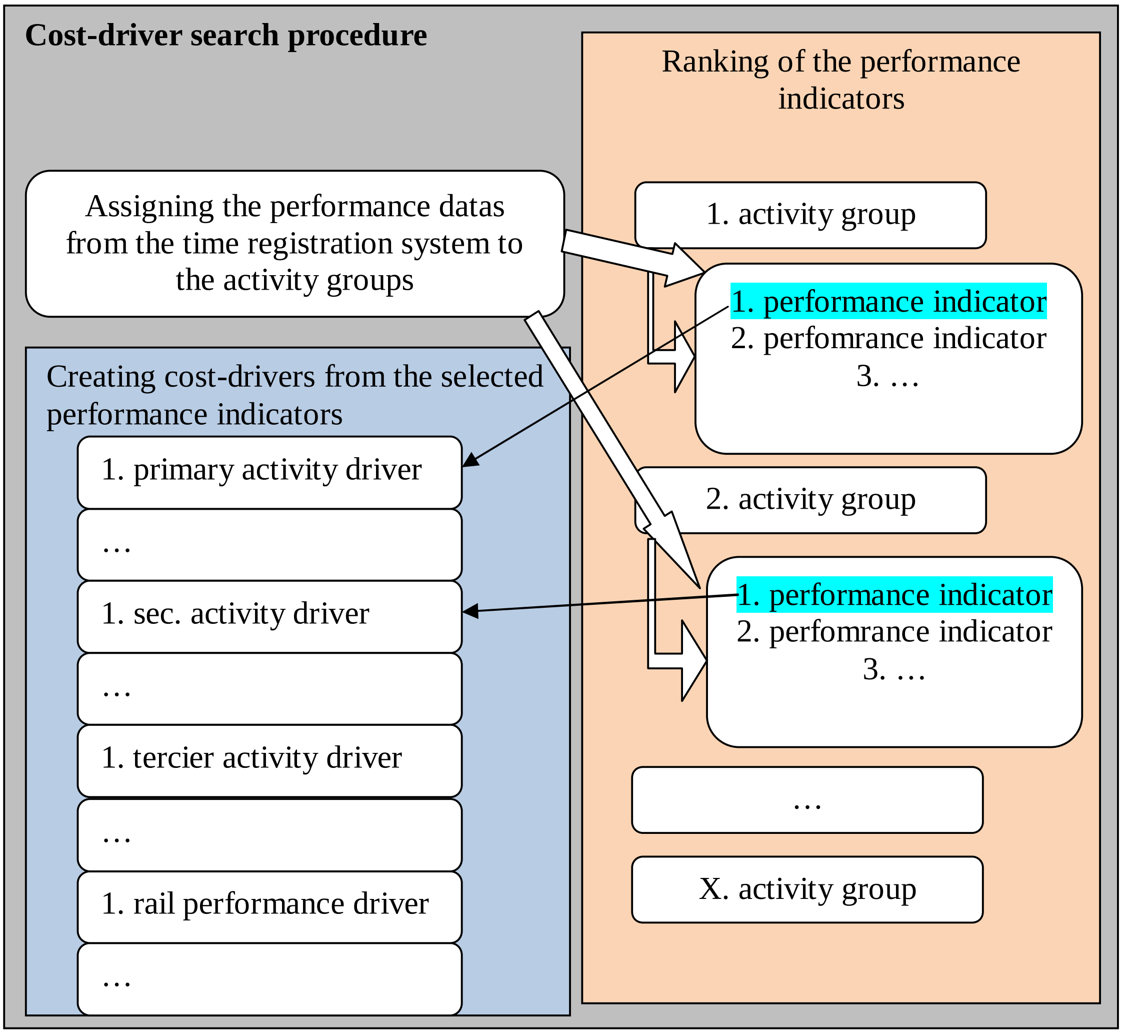

Figure 3.: The structure of the cost-driver search procedure

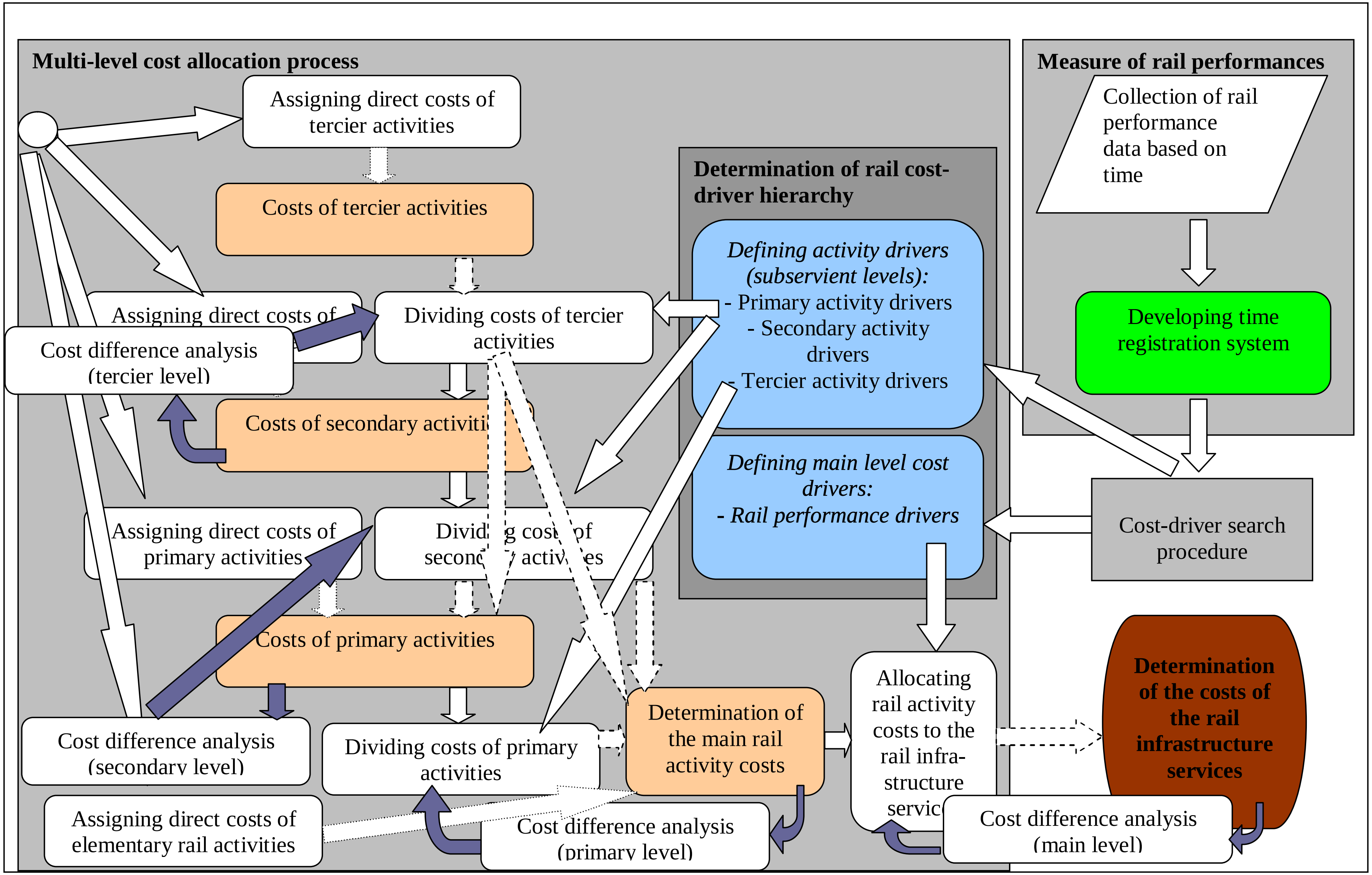

Figure 4.: Overview map of the hierarchical rail activity based multi-level cost calculation methodology

5. I worked out the mathematical formula of the combined value stream and rail activity based, hierarchical, multi-level cost calculation methodology. [Hok2010] Through a test calculation I verified how the methodology works in real-life environment. I identified that a significant part of the indirect costs can be transformed into direct costs, which increases the accuracy of the overhead cost calculation of the rail infrastructure services and it indirectly improves the methodology reliability in the way rail infrastructure charges are created. [Hok2013]

I built up the mathematical formula of the costs of each rail infrastructure services to help the calculation of the methodology. This model has two main hierarchical steps. The first step is the cost allocation of the three supporting levels to the main rail activity level with the primary, secondary and tercier activity drivers. In the second step I allocate the costs of the main rail activities to the rail infrastructure services with the rail performance drivers. The following matrix formula gives the overhead costs of each rail infrastructure services.

$$\begin{bmatrix} 1.\,Train\ path\ reservation \\ 2.\,Train\ running \\ \ldots \\ 21.\,Technical\ testing\ of\ rail\ vehicles \end{bmatrix} = \begin{bmatrix} a_1^* & b_1^* & \ldots & z_1^* \\ a_2^* & b_2^* & \ldots & z_2^* \\ \ldots & \ldots & \ldots & \ldots \\ a_{21}^* & b_{21}^* & \ldots & z_{21}^* \end{bmatrix}_{x\times 21} \times \begin{bmatrix} 1.RAC \\ 2.RAC \\ \ldots \\ X.RAC \end{bmatrix}_{1\times x} =$$

$$\begin{bmatrix} a_1^* & b_1^* & \ldots & z_1^* \\ a_2^* & b_2^* & \ldots & z_2^* \\ \ldots & \ldots & \ldots & \ldots \\ a_{21}^* & b_{21}^* & \ldots & z_{21}^* \end{bmatrix}_{x\times 21} \times \left\{ \begin{bmatrix} a_1 & b_1 & \ldots & z_1 \\ a_2 & b_2 & \ldots & z_2 \\ \ldots & \ldots & \ldots & \ldots \\ a_x & b_x & \ldots & z_x \end{bmatrix}_{n\times x} \times \begin{bmatrix} IC_1 \\ IC_2 \\ \ldots \\ IC_n \end{bmatrix}_{1\times n} + \begin{bmatrix} DC_1 \\ DC_2 \\ \ldots \\ DC_x \end{bmatrix}_{1\times x} \right\} \quad (1)$$

Where,

1., …, X. RAC: rail activity cost, the costs of main rail activities,

IC_1, …, IC_n: indirect costs, the costs of the primary, secondary and tercier supporting rail activities,

$DC_{1\ldots x}$: direct costs of main rail activities,

$\left.\begin{matrix} a_{1\ldots x} \\ b_{1\ldots x} \\ \ldots \\ z_{1\ldots x} \end{matrix}\right\}$: primary, secondary és tercier activity drivers,

$\left.\begin{matrix} a_{1\ldots 21}^* \\ b_{1\ldots 21}^* \\ \ldots \\ z_{1\ldots 21}^* \end{matrix}\right\}$: rail performance drivers.

In the test I calculated the costs only for two concrete rail infrastructure services (train running of passenger and freight trains), because of the huge amount of data and labor requirements.

To determin the cost volumes at each cost calculation level, I used the cost table of the biggest Hungarian rail infrastructure manager in the year of 2012. I regrouped the costs according to the rail activity chains within the value streams.
I deducted the cost allocation process according to the (1) mathematical formula. At the supporting levels (211-490) for the passenger trains, the indirect costs of the servicegroups (IC_{211} - IC_{490}) I calculated according to the example in formula (2), which is the product of the cost volume of each supporting value stream levels and the primary, secondary or tercier activity drivers. The calculation is the same for the freight trains.

The part of the cost of the calculation level 221 belonging to the passenger train running:

$$IC_{Sz221} = \eta_{Sz221} * IC_{221} = 0.2288 * 16\ 258\ 726 = 3\ 719\ 996 \text{ thousand HUF} \quad (2)$$

Where,

η_{Sz221}: primary activity driver for the passenger train running at the calculation level 221
IC_{221}: indirect cost part of the calculation level 221.

At the main level (111-153) for the passenger trains, the direct costs of the servicegroups (RAC_{111} - RAC_{153}) I calculated according to the example in formula (3), which is the product of the cost volume of each main value stream and the rail performance drivers. It is the same calculation for the freight trains.

The part of the cost of the calculation level 111 belonging to the passenger train running:

$$RAC_{Sz111} = \alpha_{Sz111}^{*} * RAC_{111} = 0.2420 * 10\ 319\ 479 = 2\ 497\ 314 \text{ thousand HUF} \quad (3)$$

Where:

α_{Sz111}: rail performance driver for the passenger train runing at the calculation level 111,
RAC_{111}: direct cost part of the calculation level 111.

After that the direct costs of the passenger train running I calculated as the sum of the RAC_{111} - RAC_{153} costs, the primary allocated costs as the sum of the IC_{211} - IC_{223} costs, and the indirect costs as the sum of the IC_{310} - IC_{490} costs. The calculation is the same for the freight trains.

Costs of the passenger train running:

Direct: $RAC_{Sz111} + RAC_{Sz112} + \ldots + RAC_{Sz153} = 2\ 497\ 573 + 2\ 038\ 823 + \ldots + 838\ 718 = 26\ 197\ 642$ thousand HUF (4)

Primary allocated: $IC_{Sz211} + IC_{Sz212} + \ldots + IC_{Sz223} = 168\ 379 + 74\ 563 + \ldots + 3\ 354\ 871 = 10\ 323\ 368$ thousand HUF (5)

Indirect: $IC_{Sz310} + IC_{Sz320} + \ldots + IC_{Sz490} = 480\ 707 + 68\ 549 + \ldots + 444\ 313 = 10\ 288\ 812$ thousand HUF (6)

Where:

RAC_{Sz111}, RAC_{Sz112}, …, RAC_{Sz153}: direct costs of the main calculation level for the passenger train runing,
IC_{Sz211}, IC_{Sz212}, …, IC_{Sz223}: indirect costs of the primary supporting levels for the passenger train runing,
IC_{Sz310}, IC_{Sz320}, …, IC_{Sz490}: indirect costs of the secondary and tercier supporting levels for the passenger train runing.

Name of the servicegroup	**Nature of the cost volume**	**The current cost volumes, belonging to the servicegroups [thousandFt]**	**Nature of the cost volume**	**The new cost volumes, belonging to the servicegroups [thousandFt]**
Passenger train running	Direct	7 352 609	Direct – RAC_{Sz111} - RAC_{Sz153}	26 197 642
	Allocated	29 892 731	Primary allocated – IC_{Sz211} - IC_{Sz223}	10 323 368
	Indirect	4 830 458	Indirect – IC_{Sz310} - IC_{Sz490}	10 288 812
	Sum	**42 075 799**	**Sum**	**46 809 822**
Freight train running	Direct	1 054 981	Direct - RAC_{T111} - RAC_{T153}	8 870 991
	Allocated	6 010 456	Primary allocated – IC_{T211} - IC_{T223}	4 695 452
	Indirect	1 127 054	Indirect - IC_{T310} - IC_{T490}	4 845 492
	Sum	**8 192 491**	**Sum**	**18 411 936**

Table 3.: Direct, primary allocated and indirect costs of the two servicegroups according to the currently used and the new methodology

According to Table 3., the proportion of the direct costs increased due to the the calculation structure, based on value streams, in case of passenger train running from 24.5% to 56% and of freight train running from 12.8% to 48%.

5. Utilization of the new scientific results, opportunities for further developement

The new model, methodology and their results, worked out in the dissertation, can be apply both in a theorethical environment and in practice, for supporting the management and controlling processes as well. It can be transferred not only to the Hungarian, but also to the international practice. The analysis and experiences of the new cost calculation methodology can be adapted not only in the rail, but also in the whole service sector.

The robustness of the new methodology helps the conversion of the results take into practice. On the one hand it is independent from the organizational structure of the companies. This is of great importance, because large operational and organizational changes have occured at the Hungarian incumbent rail companies in the last years.

On the other hand the methodology is independent from systems of the companies (accounting, controlling, information). The value stream can be flexible adapted to the change of activties and technological processes.

I defined the ouptputs of the value streams as hierarchical service levels, so the definition of the concrete rail infrastructure service can be adjusted to the system and the legal background. The structure of the methodology has been worked out in a way that the hierarchy of the value streams focuses on the production of the rail infrastructure services.

The value streams build on each other as based on the technological processes, so a huge amount of the processes (main value streams) can be directly assigned to the rail infrastructure services. The clear hierarchical structure facilitates a simplier and more transparent cost calculation. Consequently a greater number of costs can be directly assigned to rail infrastructure services and the cost allocation needs are less during the calculations. Furthermore the same activities, coming up at different professional field (for instance: traffic controll, interlocking), can also be taken into account not during work breakdown, but assigned to a process during the creation of the value streams.

The main costraint of the new methodology is that some, very important activities (for instance: traffic controll), which belongs directly to the main rail infrastucture activities can on the one hand not be separated from the production of the rail infrastructure services during the cost calculation. On the other hand their costs can never be allocated directly to the services, because these activities are prerequisite for the provision of all services. Finally it always remains a relative high cost of mass, which can not be transfered to the direct costs.

The results of dissertation subserve both the theoretical and practical point of view, in which the accounting and controlling system of the rail infrastructure managers can be developed in a more transparent and informed way.

The results of the dissertation can be built into the specialized curriculum for higher education. Mainly it can update the Rail Management subject, but because of the robustness of the methodology it can be used in other controlling courses as well.

6. Publications of the author

1. [Hok2009a] Hokstok Csaba: A pályavasúti költséggyűjtési rendszer kontrolling alapú átalakításának elméleti megalapozása. Közlekedéstudományi Szemle (ISSN 0023 4362), 2009/2 (p52-57)
2. [Hok2009b] Zoltan Bokor, Ph.D. – Csaba Hokstok: Improving the costing methods of rail infrastructure management. EURO-ZEL 2009, Zilina, 3-4 June 2009
3. [Hok2009c] Rita Markovits-Somogyi – Csaba Hokstok – Zsófia Bagi: Freight transport on railways: infrastructure development and decision support. 3rd SoNorA University Think Tank Conference (ISSN 1868-8411), Berlin, 11. November 2009 (p37-56)
4. [Hok2010] Zoltan Bokor, Ph.D. – Csaba Hokstok: Improving the controlling based cost calculation method used in rail infrastructure management. Horizons of Railway Transport 2010, Strecno, 16-17 September 2010
5. [Hok2011a] Mészáros Ferenc – Hokstok Csaba: A regionális vasúti közlekedés és járműbeszerzés hazai helyzetének felülvizsgálata energiahatékonysági és környezeti szempontok alapján. Közlekedéstudományi Szemle (ISSN 0023 4362), 2011/2 (p43-50)
6. [Hok2011b] Csaba Hokstok: Innovate the rail infrastructure management with developing cost calculation methodology based on ABC. Periodica Politechnica Transportation Engineering (ISSN 0303-7800, 2011/2)
7. [Hok2011c] Csaba Hokstok: New hierarchical activity based cost calculation model improved for rail infrastructure management. Horizons of Railway Transport (ISSN 1338-287-X, 2011/4, pp. 29-41)
8. [Hok2013] Csaba Hokstok: Application framework of value stream costing (VSC) for supporting rail infrastrukture controlling. LOGI Scientific Journal on Transport and Logistics (ISSN 1804-3216, 2013/01, megjelenés alatt)