INNOVATING COST ACCOUNTING PRACTICES IN RAIL TRANSPORT COMPANIES

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Abstract

Purpose: The main purpose of the study is to present and discuss an accounting innovation in the cost measurement system of rail transport companies.

Methodology: We identify the distinctive features that cost accounting systems should have in order to capture the particular structure of the production process of rail transport companies and develop an innovative accounting practice that addresses the specific features of railway services, particularly the high fixed costs associated with the infrastructure. This accounting innovation is applied to Trentino Trasporti, a medium-sized, privately owned passenger railway company operating in the Trentino Alto Adige region of Italy.

Results: Evidence suggests that the new accounting practice facilitates the operational connection between the company's resources and their consumption during the provision of transport services.

Practical implication: This connection enables companies to identify new opportunities for improvement and cost optimisation by finding the real origins of cost consumption in the provision of rail transport services.

Keywords: cost accounting in network services, activity-based costing, rail transport companies

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1. Introduction

The liberalisation of European local public transport companies has introduced some discontinuities in the industry in the last few decades, including new tendering and financing methods and the development of competition (Shaw, 2000). The primary goal of the reform process was to force rail companies to improve the quality of the services they offer to the general public while ensuring economically sustainable management of the business (Crompton and Jupe, 2002; Wolmar, 2001). The new regulatory context requires rail companies to introduce management and accounting tools that can support these ambitious objectives. In particular, measurement of costs is important both for internal efficiency (e.g., control of items such as labour costs) and for external accountability (e.g., requests for contributions to cover losses) (Humphreys and Francis., 2002). This study investigates the features of the cost accounting system that companies in the railway transport industry should adopt in order to support the new dynamics of the liberalisation process.

Following Drury and Tales' (2005) call for more case-study research on how organisational factors influence cost systems design, we propose the case of Trentino Trasporti, a medium-sized, privately owned passenger railway company operating in the Trentino Alto Adige region of Italy. After discussing why and how activity-based costing (ABC) is the most suitable system for measuring the amount of resources consumed by the cost objects (from the methodological, empirical, and operating perspectives), we highlight the system's limitations in terms of its ability to identify the costs absorbed by the rail infrastructure and the relationships between the infrastructure and the production activities of rail companies. The first contribution of this study, then, is to demonstrate that ABC is the most suitable system for measuring the costs of a railway company's production process. Although originally developed for manufacturing processes (Broad and Crowther, 2001), the ABC system is also useful in service companies, particularly in mass service companies like rail transport companies, where the structural costs are high.

However, as the case study illustrates, the ABC system cannot fully satisfy the information needs of rail companies, so we propose the adoption of a new practice, which represents the second main contribution of our study. For practitioners, we show that this innovative accounting practice takes into consideration the specific features of railway services by dealing with the managerial accounting treatment of costs associated with infrastructure, a characteristic that is common among other companies operating in network systems (e.g., utility companies).

The proposed cost accounting system can support accountants in the rail transport companies in their efforts to manage the requirements of the liberalisation process. The main consequence of the distinction made by the regulatory reforms between Railway Transport Operators (RTOs) and Railway Infrastructure Operators (RIOs) is that fees should be defined based on the costs of services utilized. The accounting practice proposed identifies the costs that belong to RTOs and those that belong to RIOs with reference to the activities of the production process and to the infrastructure.

The case analysed also shows the necessity of integrating ABC with an accounting innovation that can represent the resources consumed by the various elements of the infrastructure that support the provision of services. This innovation has important managerial outcomes for all service companies that operate with an infrastructure network, including transport, service, and utility companies, and useful implications for the accounting profession that deals with cost systems in networked-based companies.

The paper is structured as follows: the next section, section two, provides a brief overview of the changes in the regulatory environment that pose a new challenge for railway companies. Then section three presents theoretical arguments in favour of adopting an activity-based system in place of the traditional cost accounting system in rail companies. Section four proposes the innovative accounting practice, while section five presents the case study of Trentino Trasporti, an Italian rail company. Finally, section six provides some conclusions.

2. The privatisation process in the railway industry

One of requirements of the reform is that the management of the railway infrastructure (RIO) must be clearly separated from the provision of railway transport services (RTO). RTOs refer to any private or public companies whose main business is to provide rail transport services for goods and/or passengers. RIOs are any public bodies or companies responsible for establishing and maintaining the railway infrastructure and operating the control and safety systems[1].

RIOs charge RTOs a fee for using the railway infrastructure. Under the principle of non-discrimination, the fee is defined according to the nature of the service offered, considering the various elements that determine the amount of resources that are utilized (e.g., the composition of the train, the load, the degree to which the infrastructure is used, the mileage used). Thus, RIOs should be able to define their pricing policies according to the various costs they incur.

For their part, RTOs should manage their activities by providing efficient and appropriate services to the market at the lowest possible cost for the quality of the service required. The activities should be managed as private companies even when they are owned by the State or when they provide public services imposed by the State. They are responsible

[1] According to the regulation, organizational or institutional separation of RTOs and RIOs is optional, while the separation of accounts is compulsory.

for finding the resources they need to implement their business plans and achieve their financial objectives.

Within this regulatory framework, the liberalisation reform has put pressure on the role of cost accounting and cost measurement in the railway industry[2]. In order to support the process of separating the accounting system between the two main business units (i.e., management of the infrastructure and management of the transport service), it has been necessary to adopt advanced and innovative cost measurement systems (such as ABC) that allow for a clear identification of the resources consumed by the activities. However, to the best of our knowledge, the literature does not provide insights into how to build the various cost-consumption relationships among the elements of the network and infrastructure, the resources they use, and the services they provide to customers.

3. Cost accounting systems in railway companies

Notwithstanding the important regulatory innovations in the industry and their impact in terms of the cost information required, the literature has not yet provided an in-depth and specific analysis of cost systems that would fit the emerging accounting needs better or the manner in which they would do so. Most studies on rail liberalisation have focused on the British liberalisation experience and the difficulties, shortcomings, and failures of the liberalisation process (e.g., Crompton and Jupe, 2002; Shaoul, 2006; Stittle, 2004). For example, Crompton and Jupe (2002) analysis of the evaluation of the ten-year plan for the railway industry issued by the British government in 2000 focuses on the inadequacy and under-performing instruments adopted to monitor costs and the performance of operators. While the strategic plan for the British railways has raised public expectations for real improvements in the trains and stations used by customers, rail track companies have failed

[2] By using cost accounting, managers can trace the progress of their business while it is being carried out, so they can identify how each activity contributes to the overall financial results (Fearnley et al., 2004). Moreover, a suitable costing system should be able to identify resources consumed by each business area (e.g., railway transport versus railway infrastructures) in order to meet regulatory requirements.

to engage meaningfully with the regional agencies and local authorities responsible for putting the national transport policies into effect (Bolden and Harman, 2002).

Stittle (2004) discusses the accounting framework for determination of track access charges for freight and passenger traffic, highlighting its poor design and construction and its inability to reflect fully the costs borne by rail operators. Stittle identifies the cause of such failure as the generous concessions given to freight operators since British regulators do not require freight operators to pay either fixed freight costs or the costs of rail tracks, as the tracks are common to both freight and passenger operations. Thus, passenger train operators carry virtually all of the rail network's fixed and common costs. As Shaoul (2004) noted, half of general expenses are related to the infrastructure, signalling, and property and half to train operations. This evidence suggests that "rail is a high fixed-cost industry, where much of the costs are associated with providing the network" (Shaoul, 2004, p. 30).

As these studies of the British rail industry have shown, changes in technology, increased product diversity, regulatory innovations, and increased competition indicate a need for a more sophisticated cost accounting system. Although traditional costing systems based on the cost-centre methodology can identify each public transport "line" as a productive cost centre, they do not provide insight into why certain costs are incurred. The "products" of the production centres could be identified as the individual "journey", and the production volume could be expressed in terms of the number of journeys or kilometres covered, telling management in which organizational unit the costs arise. However this approach would not provide information on why certain costs arise (Kaplan, 1994), so it would not allow the management to monitor the production processes properly. We argue that adoption of the ABC system leads to understanding the "why," that is, what causes costs to occur. This claim is based on Hoque (2000) and Broad and Crowther (2001), who argue that the rapidly changing environment requires a shift from traditional costing systems to a system that reflects these challenges because cost behaviour in service companies "is complicated and thus requires additional cost drivers that are unrelated to the volume of product produced" (Hoque, 2000, p. 135).

In this sense, the literature promotes ABC as the solution to the distortion in the product costs reported by traditional costing systems (Cooper and Kaplan, 1988; Kaplan, 1994; Liu and Pan, 2007)[3]. Traditional systems assume that the products determine the indirect costs by consuming the cost driver (e.g., the hours in direct labour), which is then used to divide the indirect costs among the products. Conversely, ABC breaks the company into its strategically relevant activities along the value chain and determines their impact on cost variation and differentiation. Important studies (Miller and Vollman, 1985; Brimsom, 1988; Hergert and Morris, 1989) suggest focusing on the value chain, activities, and costing structure, which explains overhead costs rather than just allocating them. Even though ABC was initially introduced in industrial companies, the literature suggests that service firms are ideal candidates for its development since the bulk of the costs sustained by service organizations are fixed and indirect (Al-Omiri and Drury, 2007; Broad and Crowther, 2001; Cooper and Kaplan, 1988; Pierce and Brown, 2006).

However, ABC may distort costs when there is a high level of product diversity (Cooper and Kaplan, 1988; Malmi, 1999). In the case of rail companies, diversity refers to organizational support functions when their consumption differs for each product; to processes that vary in their consumption based on different journeys and prices; and to clients, which can be either companies (for freight transportation) or people. Product diversity leads to a high potential for cost distortion in the identification of resources consumed by each final product.

[3] The basic idea of ABC methodology is that resources are consumed by the activities the company carries out that are consumed by products/services.

Defining the consumption of resources in terms of activities facilitates the analysis of overhead costs. The literature offers a great deal of evidence that ABC allows great control of the structural costs of industrial companies' support functions (in other words, their service or "tertiary" activities), so it seems that ABC would be useful in service companies—particularly in mass service companies like rail transport companies—where the structural costs are very high. ABC can analyse cost structures based on high indirect costs correctly, while traditional systems often report distorted costs (Abernethy et al., 2001; Al-Omiri et al., 2007; Brierley et al., 2001; Cooper and Kaplan, 1988; 1991; King et al., 1994). The decline in the total cost of labour and the rise in the total cost of overhead relative to the total cost of production in many firms have led to calls for the use of ABC.

Rail companies are characterised by all the elements discussed above:

- They operate in the realm of service provision, even if with the specificities of a network structure.
- Their services are highly differentiated.
- Their cost structure is one in which indirect costs are highly relevant.

The debate on ABC systems has taken a number of paths, but one stream of literature debates the practices of its application (e.g., Abernethy et al., 2001). On this issue, King et al. (1994) explore the potential application of ABC in rapidly changing environments that have greater managerial demand for cost information. They investigate ABC in the health care industry after the major reform in the UK, which required both a clear understanding of the costs of specific services offered and assumptions about the efficiency of service provision to maintain competitive standards. King et al. argue that the adoption of ABC has the potential to overcome the shortcomings of traditional costing systems and significant benefits in the areas of budgeting, costs analysis and reduction, performance measurement, and customer profitability.

A second stream of literature investigates the extent of ABC adoption and the conditions under which it yields benefits to the firms that use it. In addition to describing a low rate of application of ABC in practice (e.g., Al-Omiri and Drury, 2007; Malmi, 1999), Al-Omiri and Drury (2007) find that the sophistication of a cost system is positively associated with the importance of cost information, the intensity of competition, and the type of business sector, and that service firms are more likely to adopt ABC. This last finding is in line with the arguments of Kaplan and Cooper (1998).

Thus, even if the literature does not treat the issue concerning which cost accounting system is better suited to rail companies, the various studies on the ABC system's characteristics confirm it as the more suitable cost accounting system for rail companies. Nevertheless, the adoption of ABC is not sufficient to address the needs of rail transport companies because the system cannot capture all the specificities of the production process of rail companies, particularly those that refer to the use of the infrastructure.

4. An innovation in accounting practices in railway companies: the cost destinations

Operating with a network structure posits complexity in the choice of the cost accounting system because the infrastructures imply certain costs of providing the service (Drury and Tales, 2005; Schoute, 2009). For rail companies, after all specific and common costs have been attributed to the activities that consumed them, there are still numerous cost items, including some of significant amounts, that cannot be attributed to the activities because they are not directly or indirectly consumed by them (Maher and Maraia, 1998). These costs do not link to the activities of the service provision process, but they do link to some components of the rail network infrastructure. What's more, even the outputs of certain activities of the service provision process are absorbed by specific components of the infrastructure.

This analysis highlights the need to break the infrastructure into its components and to find the relationship among the costs, the activities of the production process and the individual components of the rail infrastructure. The individual components of the rail infrastructure entail varying specific and common costs (not referred to in the activities) and link in various ways with the activities of the production process (identified and analysed by ABC). Therefore, in order to correctly identify these links, it is necessary to break down the companies' infrastructures into their component parts and to create an accounting container for each component.

Therefore, we need to create new cost containers, which we name "cost destinations," that gather the costs that have components of the infrastructure as their consumption destination. From the methodological point of view, the cost destinations are another dimension of analysis, external to the activities of the production process.

As the case shows, destinations are not activities or specific levels of activities (as hierarchy); instead, they refer to specific elements of the infrastructures used to varying degrees by each transport service provided. [4] Destinations are not even identifiable with cost centres because they do not belong to the organizational structures or refer to specific organizational units. Instead, they refer, for example, to single components of the infrastructures or elements of the network.

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[4] The application of ABC in complex production contexts leads to the development of a "hierarchy of activities", which is used when the output of an activity is not consumed by the final cost object but by another activity. In such cases, the intermediate activities are distinguished based on how the activities refer to the final output. According to Cooper and Kaplan (1991), in the context of manufacturing companies, the hierarchy of activities encompasses four levels:

- Unit-level activities
- batch-level activities
- product-sustaining activities
- facility-sustaining activities.

Defining the hierarchy of activities is useful because it identies the drivers related to the product: for every level of activity, the drivers are identified to reflect the underlying behaviour of the demand for activities by the product (cost object).

The next section presents the case study of Trentino Trasporti in order to provide insight into why network organisations like rail companies should implement a cost accounting system ad hoc, even when it differs from the systems of other companies.

5. Trentino Trasporti: main characteristics

The Trentino Trasporti S.p.A. (TT)[5] operates in the local public transport sector in the Trentino Alto Adige region through two main business units: the rail transport service (Rail Division = RD) and the coach service (Coach Division = CD). The rail transport service covers about 900,000 km with more than thirty trains and approximately 2.5 million rail passengers.

This study focuses in particular on the RD unit, which builds railway lines and manages rail transport. Its activities include maintenance of the vehicles and infrastructure, the latter of which consists of rail networks (roadbed, foundations, tracks), engineering works (bridges, flyovers, tunnels and supporting structures), overhead contact lines for electric traction, station buildings, level crossings, signal and safety systems, telephone systems, rail workshops, and train depots.

In TT's organisational structure are the two basic organisational units typical of local public transport companies[6]:

- The movement function, which represents the core of the management of transport services, deals with planning and running the transport.
- The technical service deals with storing, maintaining, and repairing the vehicles and manages the systems and infrastructures.

[5] In 1993 the autonomous Province of Trento issued a new law on local transport that promoted the constitution of Trentino Trasporti S.p.A. by merging the Società di Autoservizi Atesina S.p.A.(autoservice company) and the FTM S.p.A.(rail company). The main purpose of the merger was to rationalise public transport throughout the province, but it also aimed to expand the local railway network. In 2002, the merger took place. The new company, known as Trentino Trasporti S.p.A, was later divided into Trentino Trasporti Infrastrutture S.p.A. and Trentino Esercizio S.p.A.

[6] TT is a joint-stock company, the main shareholders of which are the Provincia Autonoma di Trento (73,75%), followed by Trento Council (18,75%), the TT (own shares – 6,91%) and other small local councils in the valleys (0,58%). The remaining shares are held by private shareholders (0,01%).

In addition to these functions, the support services consist of administration, procurement/tender, marketing and communications, general services, management control, and quality.

Today's transport companies face challenges in the areas of new regulations, the market, and the need to participate actively in tenders to obtain the concession to provide transport services. As a result, the company must develop managerial tools that can guarantee prompt delivery of information about the costs the company incurs in providing its transport services. This need was initially identified in 2002 by the CEO of the TT (today the CEO of the RD). The goals of identifying the costs of the production process were to:

- break the costs into to the company's business areas in order to create a detailed income statement with business area results, assign organisational responsibility, and separate the business of infrastructure management from the business of transport management;
- reveal the cost of the individual journey in order to compare it with the fare set by the local government (the Autonomous Province of Trento); the journey can be considered the company's service unit, as it is used to compare the fare to the cost of production.

In order to achieve these aims, the company contacted the researchers to develop an appropriate cost accounting system that would fully capture all the costs incurred in providing the transportation service, that is, both those costs linked to the service provision process and those linked to the network infrastructure. The researchers' active role included studying the specific production process of the TT, they identifying ABC as the appropriate cost accounting system with which to manage the costs of the production process, proposing the adoption of the new practice–cost destinations–to capture and manage the costs of the rail infrastructure, and supporting TT in adopting this new cost accounting system to verify that all the steps to implementation were performed correctly.

Before the application of ABC and the introduction of cost destinations, the company had used cost information that was organized by nature and that referred to single units of the organizational structure. With this system, which was quite close to the logic of the cost centre system, the company could not determine the real cost of a journey. Although the costs were allocated to single journeys based on volume parameters (n. of kilometres, n. of passengers, n. of trains, etc.), these parameters did not express the actual consumption of costs by each journey, nor did they distinguish the costs consumed by the infrastructure from those related to the actual movement of the train. However, the application of the cost destination process revealed which costs referred to the management of the infrastructure and which to the management of the transport service itself. The head of management accounting control and internal auditing managed the application of the new measurement cost system.

The next section describes analytically the various steps undertaken to implement the new cost accounting system.

Application of the ABC methodology to TT

The first step in applying ABC lies in identifying the activities that make up the production process. This phase, which lasted about three months, was carried out through interviews with the heads of the twenty-nine organisational units that make up the "movement and traffic management" and the "technical management" of the company, and through questionnaires sent to those who had to fill in timesheets. This phase led to the identification of fifty-two activities associated with the rail and coach service, listed in Table 1.

Insert Table 1 about here

The next step consisted of attributing costs to the activities by attributing the costs that exclusively concern an activity to it and attributing the costs common to more than one activity using the resource drivers. In particular, the annual cost of personnel was obtained by summing all the expenses connected to the use of human resources: basic salaries and various additional payments, including allowances, overtime, national insurance, and welfare contributions; and set-asides for severance pay or deferred payments of other kinds. The average cost of the workstation and the space needed by the personnel to carry out the various jobs was also calculated by summing all the cost items regarding or originating from the building and dividing this cost by the overall area of the office space in question, thereby obtaining a cost per square meter that was multiplied by the average area occupied by a workstation. These costs are included in the labour costs. Table 2 contains the list of the cost items attributed to the activities listed in the columns.

Insert Table 2 about here

Defining cost destinations

Numerous cost items, some of significant amounts, are not attributed to the activities, because they are not directly or indirectly consumed by them. The outputs of certain activities of the production process are absorbed by the plants, vehicles, and railway network (stations, trolleys, crossing, signs, etc.), so we decided to create new cost containers—the destinations—that gather the costs that are not referable to the activities but that have parts of the infrastructure as their consumption destination. Therefore, the companies' infrastructures must be broken into their component parts in as much detail as the company sees fit to create an accounting container for each destination. TT opted for a highly analytical definition of the cost destinations—592 in total, 437 of which pertained to the railway, 130 to the coach service, and the remaining 25 to the common infrastructures. Table 3 contains the list of all the costs destinations identified by TT[7].

Insert Table 3 about here

[7] The numbers designate coach service destinations. The number 1, referring to the bus shelters and signs, indicates that the company has created two cost designations: one that groups the bus shelters and one for all the signs; for these infrastructure components, the company chose not to go into any greater degree of analytical detail.

Each cost destination gathers:

– specific costs, which refer to the resources consumed directly and exclusively by the individual cost destination;

– common costs, which refer to the resources used by more than one cost destination and which must be attributed to these drivers; Table 4 lists the main specific and common cost items attributed to the main types of destination;

– the costs of the activities, which are attributed to the cost destinations according to how much of the output of the various activities they consume; Table 5 lists the activities that are absorbed by the main types of cost destinations.

Insert Table 4 about here

Insert Table 5 about here

Calculating the cost of the journey

At this stage of the application of the cost accounting system, the company has identified the activities and the cost destinations, has attributed the specific and common costs to them, and has allocated the costs of the activities to the cost destinations that consume their output. The next step is to calculate the cost of the journey, taking into consideration both the cost of the infrastructure and the cost of the movement of the train. The steps needed are summarised below.

The first step consists of calculating the *cost structure of the individual sections*, which is obtained by summing the costs of the cost destinations that physically exist in the individual sections. The second step consists of calculating the *cost structure of the individual journey:* the sum of the costs of all the sections that make up the individual journey are divided by the number of journeys made annually on them. Table 6 shows an example of the sections involved in the railway journey from Trento to Lavis.

Insert Table 6 about here

The third step consists of calculating the *operational cost of the individual journey* by allocating to the individual journey the cost of the activities involved and the cost destinations concerning the journey; the driver used is the time taken (by the activity) by the individual journey. The sum of these two types of cost is used to calculate the operational cost of the journey. The activities involved in the railway journey that are not related to specific cost destinations are listed in Table 7.

Insert Table 7 about here

The next step is to sum the cost structure of the journey and the operational cost of the journey to obtain the *total cost of the journey*, which represents the cost that TT incurs when a train travels, based on the length and duration of the journey. For the coach service, the cost of the journey is determined primarily by the operational cost, since there are no significant cost structures related to the railway structure. For example (Table 8), to calculate the cost structure of the Trento-Lavis journey, we divide the total annual cost of the cost destinations by the number of annual journeys (14,330 journeys). The total annual cost of the cost destinations is found by summing the costs attributed to the activities (€78,400) and the costs attributed directly to the cost destinations (€470,000). *The cost structure of the Trento-Lavis journey is €38,27* (€548,400÷14,330 journeys per year).

To calculate *the operational cost* of an individual journey (e.g., *the Trento-Lavis journey made between 7.17 am and 7.29 am with the ETO11 train),* we consider the cost of the train (cost destination) and the activities attributed to the journey in terms of the time it takes. *The costs of the train* are calculated by summing the costs of the activities attributed to the "ETO11" destination and the costs attributed to the same cost destination, for a total of €115,000 (5,000 + 110,000). The total cost of the ETO11 train is divided by the production capacity of the train (329,472 minutes' use in a year) to calculate the cost per minute, which is €0.35 (€115,000 ÷329,472). Therefore, *the cost of the train* absorbed by the 7.17 am

Trento-Lavis journey is €4.20 (€0.35 x 12 minutes). *The cost of the activities* is calculated by dividing the total annual cost of the activities (€350,000) by their annual production capacity (195,000 hours): the result of the ratio is €1.80. The cost of the activities absorbed by the Trento-Lavis journey is €21.60 (€1.80 x 12 minutes). *The total cost of the Trento-Lavis journey* between 7.17 am and 7.29 am with the ETO11 train is €64.07, obtained by summing the cost structure of the journey (€38.27), the cost of the train (€4.20) and the cost of the activities (€21.60).

Starting with the cost of an individual journey, one can calculate the *cost of the individual fare* based on the potential or actual number of passengers travelling on one journey.

6. Conclusions

The decline of monopoly management of rail transport services and the move toward efficiency have motivated demand for optimisation tools for the management of public and private transport companies' resources. Based on the ideas discussed in this study, these tools apply a cost accounting system characterised by two different but complementary types of intermediate cost aggregates: the activities and the destinations. The use of this particular cost accounting system is justified by the special nature of both the production process (in terms of the organisational structure, concurrence between production and consumption, the immateriality of output, and the great importance of the qualitative aspects of the process) and the cost structure (high significance of the costs of the network infrastructure). We believe that the system is a particularly useful tool for supporting the complex interrelationships involved in the decision processes of a rail company's strategic business units.

Applying a cost accounting system to TT's activities and cost destinations results in an accurate calculation of the cost of the individual journeys. The case study shows that it is possible to determine analytically the amount of resources consumed by the infrastructure, rather than by single transport services. This result is important to the strategically relevant task of associating the infrastructure's fixed costs with the transport services (Shaoul, 2004; Stittle, 2004).

Cost allocation is important for rail transport companies, which provide services characterised by heavy investments, a variety of clients, diversity of outputs, and considerable fixed costs. In these companies, cost allocation is often problematic because of the high costs of the plants and the infrastructure. To calculate the cost of providing a service, it is necessary to plan and implement an analytical cost accounting system that addresses both the production process and the infrastructures.

The application of the ABC system to TT underscores the fact that the costs are connected not only to the volume of the services provided but also to the characteristics of the transport lines available and to the complexity of the company's provision process. For example, with the cost accounting system previously adopted by TT (cost centres), the cost of 'planning the shifts' would have been attributed to the journeys, according to the driving time required by the journey, as though there were proportionality between the cost and the production volume. We know, however, that some lines require more work than others do in terms of planning shifts for reasons that have nothing to do with the amount of driving time, such as the number of times it was necessary to go back to the shift and timetable plan or the number of statistical observations made.

The application of ABC can also be used to control working costs, which are important in rail companies and for planning the transport. This point leads us to another fundamental aim that the adoption of the ABC methodology has allowed the company to achieve: measuring and governing the levels of performance of the service provision process. In railway companies, the process of transport provision represents the product itself;

consequently, the analysis of the activities that constitute it, their sequence, and their responsibility must take on the same importance and receive the same attention as the physical and functional characteristics of a physical product in an industrial company.

By analysing the ways in which the activities of the production process are carried out, it is possible to measure their performance (quality and time taken) in order to identify opportunities for improving it. For each activity, it is necessary to have the information (though not necessarily in terms of money) that, by explaining the cause of their execution (cost drivers) and the quality of standards reached (performance measures), can indicate how much efficiency and effectiveness the activity provides for the production process. For example, maintenance activities can be analysed other than in terms of costs, such as by the number of man hours needed, the number of repairs carried out, the number of vehicles repaired, and so on.

The ABC methodology, together with the cost destinations, links the costs of a rail company to the individual parts of the infrastructure and combines the cost information to the physical-technical information, all of which is useful for managing the capacity of the production process and the infrastructure. Thus, the accounting system proposed should be able to support the information needs that arise in the process of liberalisation better than traditional systems can because it allows the resources used by RTOs and RIOs to be distinguished.

Finally, the case study sheds light on the role of accountants in developing the appropriate systems that can capture the specific features and needs of companies that operate with an infrastructure network. Our evidence encourages researchers to investigate how accounting practices can improve accountants' ability to respond to the specific information needs of management.

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Table 1 – The activities of the TT's production process

1. *Checking lines and infrastructure,* which consists of periodically checking the condition of the railway network (tracks, points, lighting systems, line areas, stations, etc.).
2. *Propping up the tracks*, which consists of making the tracks level using special machinery.
3. *Removing and cutting grass*, which consists of removing the grass at the sides of the tracks using suitable machinery.
4. *Supervision of the railway.*
5. *Checking work done by external suppliers*, which consists of checking and inspecting work carried out by external suppliers on the railway network.
6. *Clearing snow and ice*, which consists of removing snow and ice from the tracks and stations.
7. *Cleaning buildings.*
8. *Managing maintenance material.*
9. *Managing railway maintenance personnel.*
10. *Managing coach service maintenance personnel.*
11. *Maintenance and checking of the railway infrastructures.*
12. *Management of environmental problems,* including rubbish disposal and environmental protection.
13. *Building maintenance.*
14. *Planning building work and rail systems.*
15. *Management of personnel safety*
16. *Special project management*
17. *Railway electrical maintenance.*
18. *Railway mechanical maintenance.*
19. *Railway carriage maintenance.*
20. *Carpentry.*
21. *Cleaning trains and stations.*
22. *Railway warehouse management.*
23. *Maintenance of electric signal systems (ESSs),* such as level crossings and tunnel telephones.
24. *ACS safety systems maintenance.*
25. *Maintenance of overhead cables.*
26. *Electrical maintenance of coach service.*
27. *Mechanical maintenance of coach service.*
28. *Carriage maintenance of coach service.*
29. *Cleaning of coaches and depot.*
30. *Tyre maintenance.*
31. *Management of coach service warehouse.*
32. *Minor maintenance.*
33. *Railway operations*, which consists of managing shifts of staff that travel, assigning rolling stock to the journeys, defining the composition of the trains, and applying railway regulations.
34. *Ticket sales.*
35. *Railway traffic support.*
36. *Opening/closing level crossings.*
37. *Goods transport management.*
38. *Driving trains.*
39. *Management of timetable changes* (times, stops, journeys).
40. *Coach service operations.*
41. *Driving the coaches.*
42. *Inspecting rail and coach staff.*
43. *Supervision of rail and coach services.*
44. *Sales of rental services.*
45. *Administrative management of rental services.*
46. *Management of rental shifts.*
47. *Driving rented coaches.*
48. *Co-ordinating operations on the railway network.*
49. *Co-ordinating circulation and traffic.*
50. *Driving service vehicles.*
51. *Transferring maintenance material.*
52. *Testing rolling stock.*

Table 2 – Example of cost items attributed to the activities

ACTIVITIES / COSTS	1.Checking lines and infrastructure	2.Propping up the tracks	3.Removing and cutting grass	4.Railway supervision	5.Checking work done by external suppliers	6.Claering snow and ice	7.Cleaning buildings	11. Maintenance and checking infrastructure	13. Building maintenance	17. Railway electrical maintenance	18. Mechanical maintenance of railways	19. Railway carriage maintenance	20. Carpentry	21.Cleaning trains and stations	23.ESS maintenance	25. Maintenance of overhead cables	34. Ticket sales
Personnel costs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Maintenance equipment		x						x		x	x	x	x		x	x	
Maintenance material		x						x			x	x	x		x	x	
Consumable workshop material											x	x	x				
Cleaning materials							x							x			
Consumable electrical material										x					x	x	
Miscellaneous material								x			x	x	x		x	x	
Miscellaneous maintenance								x		x	x	x	x		x	x	
Railway cleaning service							x							x			
Maintenance of ticket machines																	x
Depreciation:																	
- railway engine		x	x					x							x	x	
- railway equipment		x	x					x							x	x	
- railway workshop machines										x	x	x	x				
- ticket machines																	x

Table 3 – TT cost destinations

Railways	*N*
Propping up	1
Railway warehouse	1
ACS system	1
Railway workshop and depot	3
Track sections	44
Stations	105
Bridges	65
Tunnels	12
Trains	18
Trolleys/trucks	43
Level crossings	77
Electrical signalling systems	20
Telephone lines	3
Overhead cables	44

Coach services	*N*
Bus shelters	1
Signs	1
Bus depot	8
Coaches	116
Warehouses	4

Common	*N*
Special projects	1
Purification plant	5
Vehicles	8

Table 4 - Attribution of cost items to the cost destinations

	Overhead cables	Level crossings	E.S.S.	Track sections	Stations	Bridges and tunnels	Trains
Consumable materials:							
Sleepers				x			
Road metal-slabs				x			
Tracks and points				x			
Material for tracks				x			
Material for building maintenance					x		
Electrical material for stations					x		
Material for electrical systems	x	x	x				x
Level crossing material		x					
Overhead cable material	x						
Mechanical maintenance material							x
Electrical energy		x			x	x	x
Water					x		
Bodywork material							x
Supply of services:							
Premises maintenance					x		
Building maintenance					x		
Station maintenance					x		
Bodywork maintenance							x
Mechanical maintenance							x
Air conditioner maintenance					x		
Railway maintenance	x	x	x	x	x	x	
Depreciation:							
Head office					x		
Trento terminal					x		
Grumo S. Michele station					x		
Self-cleaning toilets					x		
Air-conditioning system at Trento					x		
Electric trains							x
Miscellaneous cost items:							
Fuel for heating stations					x		
Surveillance services					x		x
Rail transport insurance							x
Rail infrastructure insurance					x		
Rubbish disposal					x		
Inspections and certification	x	x	x	x	x	x	x
Total costs attributed							

Table 5 – Attribution of activity costs to the cost destinations

	Overhead cables	Level crossings	E.S.S	Track sections	Stations	Bridges tunnels	Trains
1. Checking lines and infrastructure	x	x	x	x		x	
2. Propping up tracks				x			
3. Removing and cutting grass				x	x		
4. Railway supervision	x	x	x	x	x	x	
5. Checking work done by suppliers	x	x	x	x	x	x	
6. Clearing snow and ice				x	x		
7. Cleaning buildings					x		
11.Maintenance/checking railway infrastructure	x	x	x	x		x	
13. Building maintenance					x		
17. Railway electrical maintenance							x
18. Railway mechanical maintenance							x
19. Railway carriage maintenance							x
20. Carpentry					x		x
21. Cleaning trains and stations					x		x
23. Maintenance of ESS		x	x				
25. Maintenance of overhead cables	x						

Table 6 - Sections involved in the Trento-Lavis railway journey

Overhead cables (in km), 5 sections: Trento station Trento-Gardolo stretch Gardolo station Gardolo-Lavis stretch Lavis station	Tracks, 6 sections: Trento station Trento-Whirdestination stretch Whirdestination-Gardolo stretch Gardolo station Gardolo-Lavis stretch Lavis station
Level crossings: 16 destinations between Trento and Gardolo	Stations: 19 cost polls
Electrical signalling systems, 4 cost destinations: Trento station Industrial area intersection Gardolo station Lavis station	Bridges and tunnels: 10 cost destinations

Table 7 – Activities linked to train journeys

33. Railway operations
34. Ticket sales
35. Railway traffic support
36. Opening/closing level crossings
37. Goods transport management
38. Driving trains
43. Supervision of rail and coach services

Table 8 – Total cost of the Trento-Lavis journey (7.17 a.m. to 7.29 a.m. with train ET011)

	Trento - Lavis – Cost details of single journey	€	
(A)	*Total annual cost of the structure: (1)+(2)*	*548.400*	**Unitary cost of the structure**
(1)	Total cost of activities attributed to destinations	78.400	
(2)	Total cost of destination	470.000	
(B)	*Number of annual journeys*	*14.330*	
(I)	**Unitary cost of the structure for the journey Trento-Lavis (A)/(B)**	**38,27**	
(3)	Total annual cost of activities	350.000	**Operating unitary cost**
(4)	Production capacity of activities (total minutes)	195.500	
(C)	*Cost of activities/minute (3)/(4)*	*1,8*	
(D)	*Length of the journey (in minutes)*	*12*	
(II)	**Unitary cost of activities of the journey Trento-Lavis (C)*(D)**	**21,60**	
(5)	Cost of activities attributed to the destination “train - ET011”	5.000	
(6)	Cost of destination “train - ET011”	110.000	
(7)	Annual production capacity (total minutes)	329.472	
(E)	*Cost of the train by minute*	*0,35*	
(F)	*Length of the journey (in minutes)*	*12*	
(III)	**Unitary cost of the train for the journey Trento-Lavis (E)*(F)**	**4,20**	
(IV)	**Operating unitary cost of the journey Trento-Lavis (II)+(III)**	**25,8**	
(V)	**Total cost of the journey (I)+(IV)**	**64,07**	