Designing a Balanced Scorecard Framework for Public Transport Organizations: The Case of IETT

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Abstract

Performance management concept, which aims to improve an organization's performance as a whole, is of fundamental importance for the enterprises, operating in both private and public sectors, even if there can be some differences in implementation. Performance management applications in public transport sector enhance the management quality of public transport organizations, which, in turn, also provides a higher service quality for passengers. In this study, Balanced Scorecard as an approach that can be applied to urban transport enterprises belonging to the public sector is adopted as a performance management method, with an implementation case for IETT, Istanbul's municipal public bus operator. Analytic Hierarchy Process (AHP) technique is employed to adapt this Balanced Scorecard method to urban transport enterprises belonging to public sector, putting forward a performance management framework that can be used by other public transport organizations as well.

Keywords: Performance management, public transport, urban mobility, balanced scorecard, analytical hierarchy process, IETT.

Introductıon

Management of ever-increasing journey and mobility demands in parallel with the growing population and income of the developed and developing cities has become one of the most important agenda items of the local authorities. Development level of public transport, the backbone of the urban transportation, is one of the most significant parameters determining the quality of life in a city. Meeting the large-scale transportation demands caused by the escalating journey needs in the most efficient and effective way is fundamentally a performance management issue. Creating an effective performance management framework in public transport and ensuring efficient management of it, has become a sine qua non for all transport authorities and organizations, especially for local governments.

A well-managed public transport system contributes to the protection of environment and improvement of the cities' quality of life by decreasing the use of private vehicles in the long run. According to Rienstra and Vleugel [1], in order for transportation sector to ensure environmental sustainability, the share of journeys by private cars needs to be decreased in all modes. Moreover, improving the quality of life with developments in sustainable transport systems is one of the common goals adopted by many countries [2]. Using performance management tools to improve the public transport services has become a crucial element for public transport providers.

In this study, the Analytic Hierarchy Process (AHP) technique is used to identify the relative weights of the dimensions and KPIs. AHP, is a multi-criteria tool for decision-making, developed by Thomas L. Saaty and used for solving complex problems [3, 4]. AHP is a mathematical method, which takes priorities into consideration and combines qualitative and quantitative variables [5]. One of the most important features of AHP is that it can incorporate both subjective and objective evaluation criteria of the decision makers. The AHP method combines information, experience, thoughts and intuitions in a logical way [6]. AHP builds a hierarchy of decision items by using a predetermined comparison scale. Paired comparisons produce weighting scores that measure how much importance decision items and criteria have with each other.

In this study, a performance measurement model has been developed for public transport operators by using the Balanced Scorecard approach, a performance measurement model, within IETT which is the public bus operator in Istanbul. In this context, first of all, the performance dimensions have been laid down and then key performance indicators (KPI) linked to them have been identified. Afterwards, a monitoring and tracking methodology has been proposed in order to ensure the effectiveness of this performance management framework. Additionally, the Analytic Hierarchy Process (AHP) technique has been adopted to identify the relative weight of the dimensions and KPIs. In the conclusion part, potential problems and risks have been discussed and solutions have been put forward to overcome them.

Literature Review

Performance management

Performance management is the act of evaluating the methodology adopted by an organization and the outcomes attained in the course of reaching the predetermined goals and objectives [7].

Within the public sector, performance can be described as the provision of goods and services presented to the society in the desired way. Thus, it is possible to define the performance management for public institutions, as a set of operations regarding the ways, methods and tools employed by public institutions while providing the necessary goods and services in an accurate and desired manner [8]. It can be said that performance management is useful for an organization as long as it provides information to what extent the organization concerned has approached the goal [9].

Performance management in organizations *"is a regime which aims to unite all employees around the common goal of continuously improving the performance and carry out necessary planning, measurement, guidance and control procedures in coordination with other management functions in order to achieve this goal"* [10]. From another point of view, performance management is *"a selection and evaluation of the organization's resources according to their performances with a view to attaining the objectives and duties of the organization in a best and most successful way"* [11]. So, performance management is an organization management approach focusing on efficiency, effectiveness and affordability and requires measuring the outcomes and results constantly in order to achieve them [12]. In other words, performance management is a process during which information about the current and future situation of the organization is collected so as to direct the organization towards the desired goals, the collected information is compared, new and necessary activities that will improve the performance are initiated [13].

Measurement of performance

The most important part of an effective performance management is the measurement of performance. In order to benefit optimally from the results of the performance measurement, such results need to be used during the performance management process. Performance management can also be described as a management system which checks whether the identified objectives have been achieved through the activities conducted and which uses the information concerning the performance in an attempt to create positive impacts on the corporate system and processes by allocating the sources to the prioritized areas. Performance measurement aims to create knowledge-based decision-making processes in management. Objectives and optimum performance indicators that allow for comparison need to be identified in order to present an objective performance measurement, and then the organization should continue with data collection and measurement. It is possible to define the performance measurement as the "methods used to measure the results and outcomes within an institution in line with the performance indicators identified previously to attain the performance improvement objectives" [11].

Key performance indicators

Performance management is based on a number of principles and criteria. One of the most important concepts in performance measurement in the literature is parameters or metrics, known as the key performance indicators (KPIs). It is possible to carry out an efficient performance measurement by means of such KPIs. While selecting the KPIs to be used in the performance measurement, some criteria are taken into consideration [14].

- KPIs must be simple, easy to understand and fit for purpose.
- They must be based on objective measurements.
- They must be easy to measure and must not bring high costs.
- KPIs must indicate the level of success accurately and the statistical characteristics of the measured event must be indicated clearly.
- A single indicator must be used to measure the same criteria in the measurement system.
- They must be flexible and adapt themselves to changing objectives.
- The indicators should be adjusted in a way to allow control over the person or group responsible for conducting the activity.

Another frequently used concept along with the KPIs is the concept of criteria. Criteria are statements which reveal the level of success and affect the selection of indicators and objectives. KPIs and criteria to be measured are closely related to one another [13].

An effective performance management program consists of a limited number of KPIs that are designed for specific goals, defined clearly, able to properly measure what it is supposed to and allow feedback and improvement. Furthermore, the data used for calculating the KPIs must be reliable, accountable, measured for a specific period and can be obtained for a low cost.

Performance table must be embraced by the person or groups responsible for KPIs and the management that will ensure the continuity of the performance management. In this study, an inclusive performance table comprising various KPIs identified to measure the corporate performance of public transport operators will be developed.

Balanced Scorecard Method

The fact that the environmental conditions around organizations change brings about the need for new management techniques. With the increasing competition and the technological

advancements, organizations realized the futility of monitoring methods that are based solely on financial data and are now on the lookout for new methods that consider environmental factors that are not financial. The "*Balanced Scorecard*" entered the management literature by Kaplan and Norton [15]. Kaplan and Norton's Balanced Scorecard can also be identified as a tool that transforms organizational strategies into action. Balanced scorecard aims to reveal the performance with all its aspects by focusing on financial and non-financial criteria in a balanced manner.

To provide a more comprehensive definition; balanced scorecard is a performance measurement and management system that is based on non-physical values such as customer focus, development and improvement of internal activities, and learning and growth aimed at the employees. It measures these dimensions using certain indicators, provides strategic feedback to ensure balance and integration among the dimensions, and makes the strategies dynamically applicable by considering future customer satisfaction along with the organization's past financial values [16].

Thanks to the balanced scorecard, objectives and strategies are turned into performance indicators and performance becomes manageable multi-dimensionally.

At this point, one of the reasons why we have decided on the balanced scorecard approach for this study is that it offers a dynamic management dimension. Traditional performance measurement approaches that are based on financial data and static statistics prove ineffective when it comes to measure and manage the performance of so dynamic a sector as public transport. The multi-dimensional structure of the balanced scorecard offers an approach that keeps in mind the development of those working with a sustainable dimension, the effects on social and environmental dimensions, passenger satisfaction and financial balance.

Performance management

One of the most original aspects of the Balanced Scorecard methodology is that it brings a "balanced" approach to the performance measurement and evaluation. To this end, a performance evaluation is conducted based on a framework of differing dimensions. The dimensions of the balanced scorecard are not limited to a financial measurement; it is also made up of the learning and growth potential of the organization based on its fund of knowledge, the depth of the relationship established with the customers and the quality of internal processes that support all of these. Below will be explained how these dimensions should be put together to form a balanced scorecard and what the scope of these dimensions should be.

Public Transportation in Istanbul

Public transportation systems cover a wide range of transport modes, including road, rail, and maritime networks. Road transport mode includes buses, minibuses, service vehicles and shuttles; rail transport covers light rail vehicles and funiculars; maritime transportation vehicles incorporate ships, sea buses and motorboats. The data for March 2015 indicates that there were 9,674,385 road passenger journeys on average per day; 1,605,384 rail passenger journeys and 264,252 sea passenger journeys in Istanbul. The total number of journeys for all transport modes equals to 11,544,029 on average per day. Considering the sheer volume of passengers, it is clear that performance management systems will affect a quite large population.

Considering the fact that the annual population growth rate of Istanbul is around 2.7% and the population will be increasing at the same speed in the next few years, it is estimated that the total growth rate will reach 14.25% in five years [18]. In line with the goal of extending the length of

rail network from 142.15 km (as of March 2015) to 420 km by the end of 2019, it is expected that road transportation networks feeding the rail network will also play a more active role [19].

As the share of public transport grows, the need for efficient, integrated and inclusive performance management model also grows so that the performance of the entire system can be measured. In the long term, it can be predicted that the above-mentioned integrated performance management system will become a must, if a single authority starts to manage the public transportation in Istanbul. This study develops a performance management model, based on the framework of a balanced scorecard, especially for IETT. The model embodies the expectations of all stakeholders, especially the passengers. Hence, it can be said that performance management model, which will be developed at the end of Section 5, will have a framework that can fulfill such needs.

Balanced Scorecard Application in a Public Transport Organization (Iett)

Balanced scorecard dimensions and key performance indicators (KPIs)

After identifying objectives, goals and processes, the most important step is to set balanced scorecard dimensions and key performance indicators to measure and manage the performance of IETT. First of all, it can be said that four dimensions (customer, financial, internal processes, learning and development) of the balanced scorecard are not sufficient for the public transport organizations. As sustainable public transport approaches have become more widespread, environmental dimension must also be incorporated into the balanced scorecard together with the health and safety dimension.

After identifying the dimensions in this way, the most important step is to set out the KPIs, as comprehensive measurement tools, by using as few performance indicators as possible. Upon the selection of KPIs, a methodology will be used to categorize the KPIs and balanced scorecard dimensions according to their importance levels. In this study, Analytical Hierarchy Process (AHP) method will be applied in order to determine the importance levels. All dimensions of the balanced scorecard shall be formed together with the KPIs and their importance levels in Section 5.2.

Passenger/Customer dimension and KPIs

While this dimension is called customer dimension in the standard balanced scorecards, it can be renamed as passenger dimension for the public transport organizations. The following performance areas should be assessed for this dimension: passengers' opinions on the performance of IETT services and IETT's performance evaluation to be made at the passenger contact points.

Furthermore, the performance of the mobile passenger information systems should also be measured, as the mobile applications have gained more significance in recent years. 3 key performance indicators given below will be used to measure all aspects of the customer/passenger dimension.

1. *Ratio of Passenger/Customer Satisfaction (%)*
2. *Service Quality Measurement Score (SQMS) (%)*
3. *Ratio of Mobile Passenger Information (%)*

Financial dimension and KPIs

Public transport organizations should also monitor their financial sustainability to ensure the efficient and effective use of resources. Since this study explores the performance measurement approaches for the public transportation organizations that are public institutions, operating cost

coverage ratio will be used instead of the profitability ratio. In addition to this, budget realization ratios should also be measured and costs per journey and kilometer should be monitored in order to manage the costs more efficiently.

1. *Operating Cost Coverage Ratio (%)*
2. *Ratio of Expense Budget Realized (%)*
3. *Operating Cost Per Journey*
4. *Operating Cost Per Kilometer*

Environmental dimensions and KPIs

Although environmental dimension is not included in the dimensions of a standard balanced scorecard, it is a very important performance indicator for public transport organizations. Public transport organizations must develop a vision, mission and strategies in order to minimize the environmental damage they cause. Environmental damage must be minimized by tracking the amounts of emissions, the measurements of carbon footprints, and the fuel consumption rates.

Furthermore, besides the diesel engines, environmentally sensitive and alternative fuel vehicles (CNG, electric, hybrid and biodiesel) have become more popular in the past few years.

1. *Amount of Emission per Journey*
2. *Amount of Fuel Consumption per Kilometer*
3. *Ratio of Alternative Fuel Vehicles*
4. *Total Amount of Carbon Footprint per Kilometer*

Health and safety dimensions and KPIs

Although health and security dimension is not included in the dimensions of standard balanced scorecards, it is a very important performance indicator for the public transport organizations.

Public transport organizations have a duty to ensure the safety of transportation services and take necessary measures to prevent accidents. Furthermore, the occupational accident rate can also be considered an important indicator showing the performance of an organization of this size.

Vehicle and passenger accidents and security incidents during the service should also be monitored and minimized.

1. *Number of Occupational Accidents per 1.000.000 Working Hours*
2. *Number of Vehicle Accidents per 1.000.000 Kilometers*
3. *Number of Passenger Accidents per 1.000.000 Kilometers*
4. *Number of Security Incidents during Service per 1.000.000 Journeys*

Internal processes dimensions and KPIs

Public transport organizations are also responsible for delivering transportation services in a timely manner. In addition to this, existent sources should be used efficiently in order to ensure the effectiveness of internal processes. Public transport operators, which stick to a dependable timetable and deliver services with minimum number of accidents, are more efficient. Efficiency and effectiveness of internal processes can be measured by using the performance indicators like regularity and punctuality ratios, ratio of dead kilometers with regards to the efficient use of resources, ratio of vehicle use during peak times and the average distance between two failures.

1. *Ratio of Regularity (%)*
2. *Ratio of Punctuality (%)*
3. *Ratio of Dead Kilometers (%)*
4. *Average Kilometers between Two Failures*

5. *Ratio of Lost Kilometers (%)*
6. *Ratio of Vehicles Used During Peak Hours (%)*

Learning and growth dimensions and KPIs

Learning and growth dimension is the most important factor triggering the improvements with respect to other dimensions in the balanced scorecard. Internal capacities like human resources, intellectual capital and organizational culture provide helps create corporate values. These elements, which can be regarded as the invisible assets of an organization, contribute to the sustainability of corporate development. Public transport organizations, as public institutions, should give due importance to this dimension and support the developments in other dimensions, as well. IETT improves the areas concerning the learning and growth dimension by using the KPIs like the ratio of IETT employee satisfaction, self-evaluation score based on EFQM excellence model, average duration of training per employee and ratio of suggestions put into practice.

1. *Ratio of Employee Satisfaction (%)*
2. *EFQM Self-Evaluation Score*
3. *Average Duration of Training per Employee*
4. *Ratio of Suggestions Put into Practice (%)*

Using the Analytic Hierarchy Process (AHP) to identify the dimensions and indicator weights of the Balanced Scorecard

The framework for balanced scorecard can be used as a performance management tool, together with its dimensions and key performance indicators. However, it is hard to say that all dimensions and all performance indicators have the same importance level in terms of measuring the corporate performance. Furthermore, two different performance indicators of the same dimension can also have different weights with respect to their contribution to the corporate performance. In this study, Analytic Hierarchy Process (AHP) method will be used to determine the weights of balanced scorecard dimensions and performance indicators.

AHP method and paired comparisons are used to produce weighting scores of key performance indicators and balanced scorecard dimensions developed for public transportation organizations.

In order to obtain the most accurate results, AHP application requires a sufficient number of qualified experts. 13 experts and managers from various departments are interviewed to get their evaluations.

Firstly, the dimensions and indicators are placed into the both axes of a square matrix in order to weight the balanced scorecard dimensions and performance indicators. For each dimension, pair-wise comparisons with other dimensions are made. **Table 1** shows the normalized AHP table and dimensional weights. **Fig. 1** shows the overall performance table with all dimensions, KPIs and relative weights of dimensions and KPIs.

Table 1. Normalized AHP table and dimensional weights

NORMALIZED	Customer/Passenger	Internal Processes	Environment	Health and Safety	Financial	Learning and Growth	Weights
Customer/Passenger	0.35	0.50	0.32	0.34	0.28	0.35	**36%**
Internal Processes	0.08	0.12	0.16	0.17	0.14	0.16	**14%**
Environment	0.11	0.07	0.10	0.09	0.11	0.11	**10%**
Health and Safety	0.21	0.14	0.23	0.20	0.25	0.18	**20%**
Financial	0.15	0.10	0.11	0.09	0.12	0.11	**11%**
Learning and Development	0.09	0.07	0.08	0.10	0.09	0.09	**9%**

Fig. 1. Overall balanced scorecard framework including all dimensions and KPI weights

Customer / Passenger Perspective (36%)
- **Ratio of Customer Satisfaction (62%)**
- **SQMS (25%)**
- **Ratio of Mobile Passenger Information (13%)**

Financial Perspective (11%)
- **Operating Cost Coverage Ratio (42%)**
- **Ratio of Expense Budget Realized (16.5%)**
- **Operating Cost Per Journey (21%)**
- **Operating Cost Per Kilometer (%20,5)**

Environmental Perspective (10%)
- **Amount of Emission Per Journey (27%)**
- **Amount of Fuel Consumption Per Kilometer (19%)**
- **Ratio of Alternative Energy Vehicles (25%)**
- **Total Amount of Carbon Footprint Per Kilometer (29%)**

Health and Safety Perspective (20%)
- **Number of Occupational Accidents Per 1.000.000 Working Hours (33%)**
- **Number of Vehicle Accidents Per 1.000.000 Kilometers (19%)**
- **Number of Passenger Accidents Per 1.000.000 Kilometers (35%)**
- **Number of Security Incidents During Service per 1.000.000 Journeys (13%)**

Internal Processes Perspective (14%)
- **Regularity (20%)**
- **Punctuality (25%)**
- **Ratio of Dead Kilometers (%)**
- **Average Kilometers Between Two Failures (9%)**
- **Rate of Lost Km (13%)**
- **Ratio of Vehicle Use During Peak Hours (23%)**

Learning and Development Perspective (9%)
- **Employee Satisfaction Rate (39%)**
- **EFQM Self-Evaluation Score (25%)**
- **Average Duration of Training Per Employee (22%)**
- **Ratio of Suggestions Put into Practice (14%)**

Conclusions

The balanced scorecard approach elaborated above provides many benefits to the public transport sector as a performance management tool. Public transport organizations need management models that would meet the expectations of all stakeholders in a balanced way. With its different dimensions, the balanced scorecard approach offers a management model which considers the expectations of passengers, organizations, local governments, employees and the society as a whole. The balanced scorecard model created for IETT can also be utilized by all public transport organizations. Through this model which would be used efficiently also in rail and maritime transportation, a more dynamic framework for corporate performance management has been provided. Thus, sustainable success in all transportation modes would be achieved. If all transport modes were managed by a single public transport authority in Istanbul, the balanced scorecard application laid down in this study would be able to provide the required corporate performance management model.

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