PRACE NAUKOWE
Uniwersytetu Ekonomicznego we Wrocławiu

RESEARCH PAPERS
of Wrocław University of Economics

Nr 434

Quantitative Methods in Accounting and Finance

Publishing House of Wrocław University of Economics
Wrocław 2016

Copy-editing: Elżbieta Macauley
Layout: Barbara Łopusiewicz
Proof-reading: Barbara Cibis
Typesetting: Agata Wiszniowska
Cover design: Beata Dębska

Information on submitting and reviewing papers is available on websites:
www.pracenaukowe.ue.wroc.pl
www.wydawnictwo.ue.wroc.pl

ISSN 1899-3192
e-ISSN 2392-0041

ISBN 978-83-7695-589-6

The original version: printed

Publications may be ordered in Publishing House:
Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu
ul. Komandorska 118/120, 53-345 Wrocław
tel./fax 71 36-80-602; e-mail: econbook@ue.wroc.pl
www.ksiegarnia.ue.wroc.pl

Printing: TOTEM

Contents

Preface

This book presents the results of Polish-Ukrainian scientific cooperation. It contains the papers prepared for the 10th international conference "Quantitative Methods in Accounting and Finance". Accounting and finance face nowadays many challenges. They require both an international and local approach, they need to be considered from the theoretical and practical point of view, and they also encourage general and specific analysis.

Support from quantitative methods is needed in order to discover, implement and verify new finance and accounting trends, methods and instruments. The research papers which are part of this book present different aspects of accounting and finance combined with a quantitative, in particular Econometric, approach.

Some of the papers focus on methodology of measurement, estimation and forecasting of financial phenomena, especially those related to investment processes. Others address specific problems of accounting such as accounting solutions for different branches, legal issues of accounting, responsibility and reporting. An alternative approach was also undertaken and the roles of a narrative and culture in accounting were presented.

The variety of papers selected for this issue ensures the complexity of the book. It provides theoretical as well as empirical material which can be used in further research and in business practice, particularly in accounting and finance. We hope that the content of the book provides a starting point for scientific discussion and practical changes.

Marta Nowak

PRACE NAUKOWE UNIWERSYTETU EKONOMICZNEGO WE WROCŁAWIU
RESEARCH PAPERS OF WROCŁAW UNIVERSITY OF ECONOMICS nr 434 • 2016

Quantitative Methods in Accounting and Finance

ISSN 1899-3192
e-ISSN 2392-0041

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PERFORMANCE MANAGEMENT IN A WATER AND SEWERAGE COMPANY

ZARZĄDZANIE DOKONANIAMI W PRZEDSIĘBIORSTWIE WODOCIĄGOWO-KANALIZACYJNYM

DOI: 10.15611/pn.2016.434.20

Summary: The article aims to show the process of designing and implementing a performance management system in one of the largest water and sewerage companies in Poland and to present key conclusions based on research and pertaining to the weaknesses of this system. First, different approaches towards designing and implementing the performance management system are presented. The first steps of designing and implementing the performance management system should be the strategic analysis and instruments which support management and are applied at that time in the company. Outlining the plan of designing and implementing the performance management system can only begin with the evaluation of the corporate strategy, state of organisation and the currently applied methods which support management. The plan should be preceded by analysing the reasons for the failure of implementing the performance management system, if such implementation was carried out. Thus only this plan establishes the stages of designing and implementing the performance management system. Then the author goes on to list the key stages of designing and implementing the performance management system which took place in the water and sewerage company. The results of the diagnosis carried out in this company are given first and they include the pursued strategy, situation of the company, status of implementation of the controlling system including cost accounting system. Finally, there are presented the final conclusions regarding performance management introduction in the water and sewerage company.

Keywords: performance management, KPI, process, water supply, sewerage.

Streszczenie: W artykule przedstawiono proces projektowania i implementacji systemu zarządzania dokonaniami w jednej z największych spółek wodociągowo-kanalizacyjnych w Polsce wraz z kluczowymi wnioskami z wdrożenia tego systemu, bazującymi na rzeczywistych doświadczeniach autora. W pierwszej kolejności zaprezentowano różne podejścia do projektowania i wdrożenia systemu zarządzania dokonaniami. Do pierwszych kroków w projektowaniu i implementacji systemu zarządzania dokonaniami zaliczono analizę strategiczną przedsiębiorstwa i instrumentów wspomagających zarządzanie, które zostały dotychczas wdrożone w przedsiębiorstwie, zatem wytyczanie planu wdrożenia systemu zarządzania

dokonaniami powinno się rozpoczynać od oceny strategii korporacyjnej, stanu organizacji przedsiębiorstwa oraz stosowanych metod wspomagających zarządzanie. Opracowywany plan powinien być poprzedzony również analizą przyczyn niepowodzeń we wdrażaniu systemu zarządzania dokonaniami, o ile wcześniej były podejmowane próby takiego wdrożenia. W tekście przedstawiono kluczowe etapy wdrożenia systemu zarządzania dokonaniami w przedsiębiorstwie wodociągowo-kanalizacyjnym, a także zaprezentowano kluczowe wnioski i bariery dotyczące implementacji systemu zarządzania dokonaniami w przedsiębiorstwie wodociągowo-kanalizacyjnym.

Słowa kluczowe: zarządzanie dokonaniami, mierniki dokonań, proces, przedsiębiorstwo wodociągowo-kanalizacyjne.

1. Introduction

The term Performance Management relates to a system which supports the transformation of plans into actual financial and non-financial results of a company [Cokins 2009, p. 9]. The system should also contribute to generate value both for clients and owners of the company (shareholders) through assistance in achieving the competitive advantage. The particular role of performance management in gaining competitive advantage results from the cross-cutting nature of this tool which allows us to monitor and control the performance management with regard to:

- various levels of management (strategic and operational level),
- various spheres of activity (research and growth, basic operational processes, supporting processes, customer service etc.),
- results achieved in a current period and factors determining the future performance of the enterprise.

The objective of this article is to show the process of designing and implementing a performance management system in one of the largest water and sewerage companies in Poland and to present the key conclusions concerning the weaknesses of this system based on research.

2. Process of designing the performance management system

The literature indicates two different approaches towards designing and implementing a performance management system. The chronologically ordered stages of designing and implementing a performance management system are mentioned most frequently. Mike Bourne, John Mills and others list three essential phases of designing and implementing the performance management system [Bourne et al. 2000, p. 757]:

– design of performance measures,
– implementation of performance measures,
– use of performance measures in the management of the company.

The above-mentioned authors point out that the first phase should be preceded by the identification of the precise goals for individual business units, process owners etc. These goals should be derived from the corporate strategy.

The following stages of designing and implementing the performance management system have been proposed by Bartłomiej Nita [Nita 2014, p. 45]:

- creation of a design team and drafting an implementation plan,
- analysis of the company's needs and its situational circumstances,
- design of performance measures,
- design of the initial version of reporting systems,
- selection of adequate IT tools,
- presentation of arrangements to users,
- final design of the system,
- implementation of the system,
- training for users.

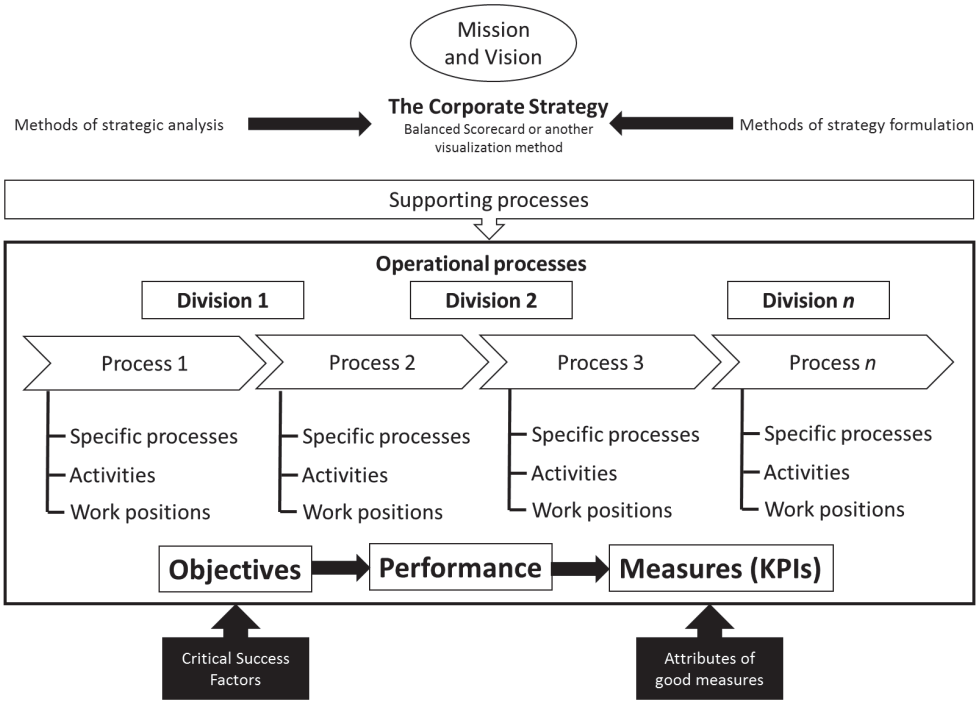

Fig. 1. Phases in developing a performance measurement system in companies

Source: own study.

In the economic reality of numerous companies, the process of designing and implementing a performance management system does not proceed according to the presented chronologically ordered stages. Designing and implementing a performance

management system should begin with the strategic analysis and tools which support management and are currently used in the company. Only performing diagnosis concerning the corporate strategy, state of the organisation and currently applied methods which support management may be a starting point for outlining the plan of design and implementation of the performance management system. Development of the plan should be preceded by the analysis of reasons for failure to implement the performance management system if implementation was attempted before. Thus only in this plan, the stages of designing and implementing the performance management system are specified in detail.

Defining performance measures on different levels of management in the company requires determining targets for the process owners and business units. Drawing-up the corporate strategy is a starting point for designing the performance management system which includes the measurement of performance as one of its elements. The strategy may be developed on the basis of different analytical techniques and methods as well as various tools which support its visualisation, for example the Balanced Scorecard. The general idea of creating the performance measurement system is illustrated in Figure 1.

3. Designing and implementing the performance management system in the water and sewerage company

The presented example pertains to designing and implementing the performance management system in one of the largest water and sewerage companies in Poland. Firstly, the diagnosis was carried out with regard to the state of company preparation to begin work on designing and implementing the performance management system. The diagnosis provided the following conclusions:

- the company had no formal strategy approved by the Management Board that could be clearly communicated to all employees; the Management Board and some members of the top management have been aware of the essential strategic objectives, which, however, were not included in any formal document nor strategic balanced scorecard,
- the company has already implemented the process structure in parallel to the existing functional structure, whereas the identified main and specific processes were still undergoing some modification,
- the company established an internal team for designing and implementing the performance management system; the team has developed an initial list of objectives and their performance measures (KPIs); unfortunately, due to the absence of an explicit strategy the team did not know which objectives are most crucial for the company; this situation resulted in the plurality of objectives and their performance indicators for different organisational units of the company and process owners; the large number of objectives and their performance indicators made unclear the matters significant for the company; furthermore, the developed

objectives and their performance measures did not meet the requirements of the correct design which resulted from the lack of proper substantive support; all of this caused the team to come to a standstill on its way towards designing and implementing the performance management system,
- the persons who were to be responsible for the implementation of set objectives did not accept them; moreover the structure of individual performance indicators for the objectives was questioned;
- the data collection and storage systems applied in the company and the cost accounting system in place did not provide the broad availability of information necessary for calculating primarily designed performance measures for objectives (KPI); in particular, the cost accounting system, including budgetary and cost control system, was based mainly on costs by type; individual cost centres singled out on the basis of the functional structure were responsible for a given prime cost incurred at the company level.

The performed diagnosis allowed the author to formulate the reasons for the failure of designing and implementing the performance management system, which subsequently enabled putting the project on the right track. First of all, the diagnosis made it possible to develop a new plan of designing and implementing the performance management system. Nevertheless, the task of designing and implementing this system was easier due to the full determination of the Management Board as its members recognised the multiple advantages associated with the implementation of this project. The new plan of designing and implementing the performance management system envisaged:
- approving the formal corporate strategy and communicating it to key personnel (level of department directors and managers of particular sections);
- conducting training with individual process owners with the participation of members of the team appointed to implement the project and external consultants whose intention was to formulate objectives at various levels of management connected with strategic objectives, to define critical success factors and to design implementation measures for objectives;
- implementing, if necessary, the required changes in the structure of the process which has already been implemented;
- drawing up standards to be pursued by values of implementation measures for objectives; the standards have been specified on the basis of benchmarking analysis,
- developing a reporting system on achieved implementation measures for objectives (KPI) combined with the procedure of explaining the reasons for the deviation from the set standards, the analysis of trends and taking corrective measures;
- designing a new cost accounting system adjusted to new the information needs of the company;

- identifying necessary changes on the part of IT systems, in particular with regard to the acquisition and collection of data concerning the course of operational and sales processes which would enable the automated calculation of the defined implementation measures for the objectives (KPI).

The project related to designing and implementing the performance management system is expected to take six months.

Once the plan of designing and implementing the performance management system in the water and sewerage company was drawn up, firstly, efforts were undertaken to develop a corporate strategy. The analysis of stakeholders' expectations was chosen as a basic method of strategic analysis and formulating the strategy due to the relatively stable conditions for business activities.

The basic stakeholders of this company include:

- the town with county (district) rights, which at the same time owns shares of the company,
- clients of the company, that is consumers of water and sewage services,
- community in the broadest sense, including environmental organizations,
- institutions which fund the business operations of the company, including mainly investment activities,
- employees of the company.

The developed strategy was a starting point for defining objectives at various levels of management in the water and sewerage company, key performance indicators (KPI) and critical success factors. The development of the performance management system was preceded by the implementation of a process structure in the company. Objectives and key performance indicators resulted from the strategy and were formulated for individual process owners.

From the process structure, the main and specific processes were derived. From the basic operational activity the following primary main processes were distinguished:

- process of acquiring consumers and connecting them to the water and sewage network,
- process relating to water supply,
- process of sewage collection and treatment,
- process of settlement of sales and handling contracts.

Targets and key performance indicators were defined at individual levels of management, then they were linked up together by means of the cause and effect relationship. The general idea of creating the performance management system in water and sewerage company and the structure of main and specific processes related to the operational activity is illustrated in Figures 2 and 3.

As stated before, the corporate strategy was a starting point for forming the objectives and key performance indicators at the separate levels of management, basically at the level of the main and specific management processes. For the purpose of setting goals to process owners, the adopted principle envisaged that every process

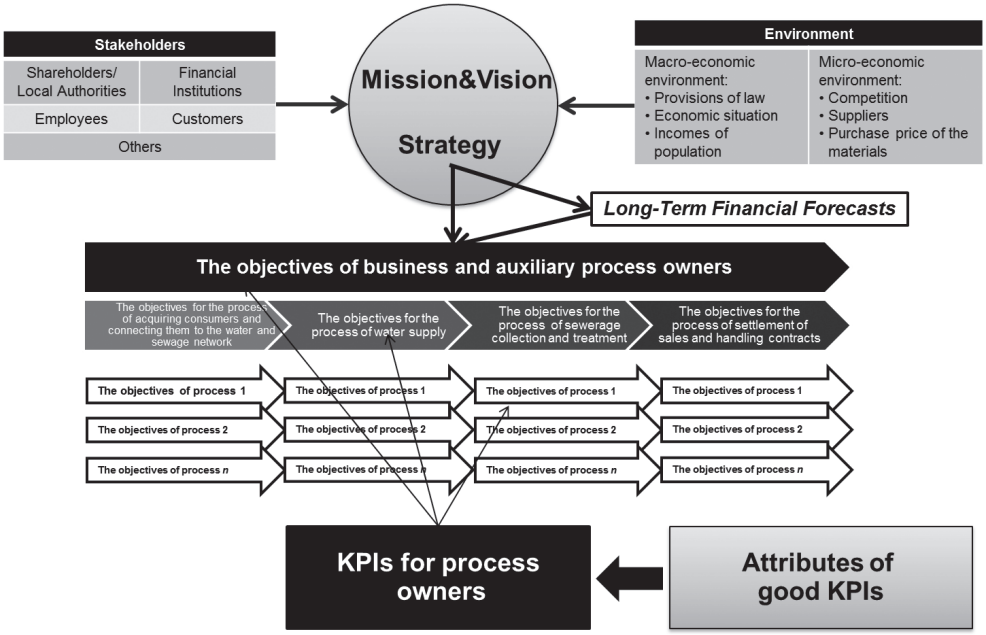

Fig. 2. Development of a performance management system in a water and sewerage company

Source: own study.

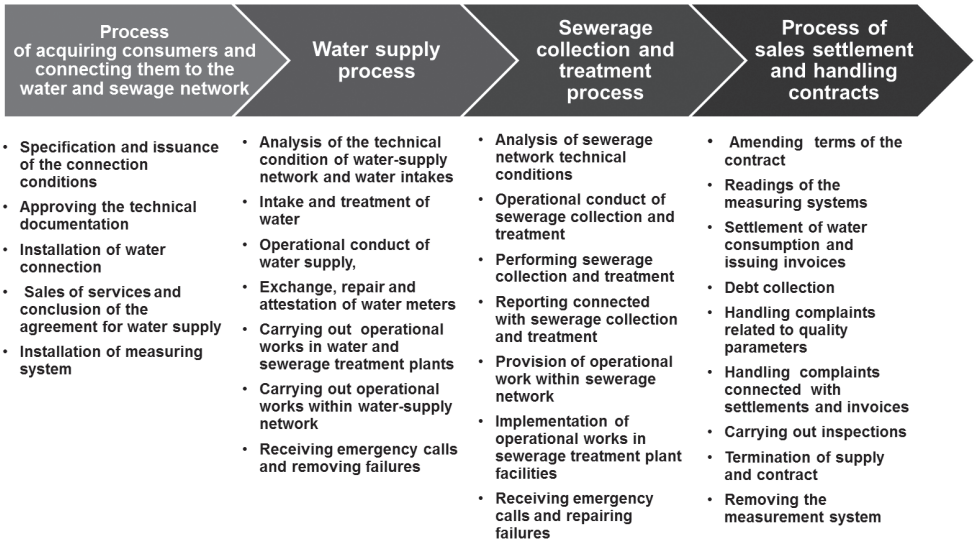

Fig. 3. Main and specific processes related to the operational activity of water and sewerage company

Source: own study.

owner should focus on the implementation of not more than three basic objectives, for which key performance indicators were properly developed and crucial success factors were identified. Exemplary objectives and key performance indicators for the owners of main operational processes are illustrated in Figure 4.

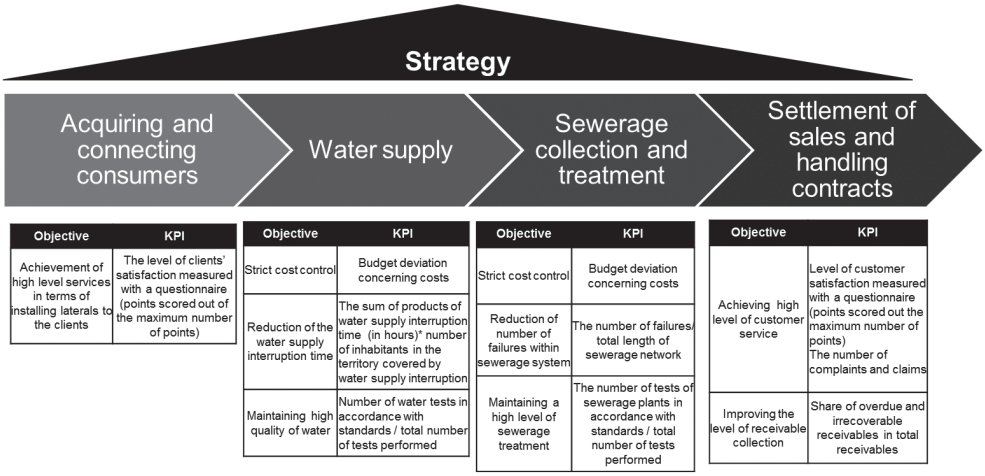

Fig. 4. Exemplary objectives and performance measures for the owners of the main operational processes

Source: own study.

The objectives and key performance indicators for the owners of main operational processes, presented above, reflected the most significant issues for the company resulting from the designed strategy including:

- …?
- improving customer service,
- cost control,
- reduction of consequences negative for the consumer and connected with interruptions in water supply,
- reduction of the number of failures,
- fulfilment of all standards concerning sewerage treatment,
- improving collection of amounts due.

At the next level of management, that is at the level of specific process owners, also the principle envisaging that the number of goals and key performance indicators assigned to them should not exceed the number of three was followed. Then, process owners can concentrate their attention on the implementation of the most important tasks which are essential with regard to the corporate strategy. Exemplary objectives and key performance indicators (KPI) for specific processes within the main process relating to water supply are presented in Table 1.

Table 1. Exemplary objectives and key performance indicators for specific process owners concerning water supply

Name of specific process	Objectives for process owners	Key Performance Indicators (KPI)
1	2	3
Analysis of the technical condition of water network and intakes	Enhancing the effectiveness of investment planning and renovations in water treatment plants	*The number of places selected to pursue investments and renovations in water treatment plants in a quarter* / *The number of failures which occurred in water treatment plants except for places selected for investments and renovations in a quarter*
	Enhancing the effectiveness of expenditure for investments and renovations of water network	*The number of places selected to pursue and renovations in water treatment plants in a quarter* / *The number of failures which occurred in water supply network except for places selected for investments and renovations in a quarter*
Intake and treatment of water	Ensuring continuity in water supply to town and reducing the number of exceedances of required water limits in containers	*The number of exceedances of the allowed limits of water in containers per day (maximum and minimum level)*
	Ensuring continuity in water supply to town and reducing the number of changes in water flow	*The number of changes in raw water flow per day*
	Maintenance of high level water quality	*The number of water samples meeting all quality parameters per day* / *Total number of samples per month*
Operational conduct of water supply	The appropriate pressure of water delivered to the clients	*The number of exceedances of desired water pressure thresholds (maximum and minimum –except failures) in water-supply network in predefined inspection points per month*
Replacement, repair and authorization of water meters	Reduction of number of complaints on failure indications of water meters	*The number of justified complaints concerning indications of the measuring system in a quarter concerned* / *The number of all complaints concerning indications of the measuring system in a quarter concerned*
	Timely replacement of water meters	*The sum of days of delay in legalization replacements of these water meters which are subject to such replacements according to the status by the end of the month ,* / *The number of legalization replacements not performed in time according to the status by the end of the month*

1	2	3
Carrying out maintenance works within water intake and treatment devices	Keeping the installation of water intake and treatment in high availability	*The sum of hours of availability of main installations and plants of water intake and treatment* / *Number of installations where availability is measured by multiplying number of hours per month ×100%*
Carrying out maintenance works within water supply network	Reduction of malfunctions within the network	*The number of failures within water-supply network during the last four quarters* / *Total length of water system aged above 20 years*
	Reduction of water losses in water network	*Water losses within the water-supply network during the last four quarters* / *Total length of water-supply network*
Receiving emergency calls and removing malfunctions within water network	Shortening the time of occupying the roadway while removing failure within the water system	*Sum of number of days with traffic disruptions for all failures in case of which the removel of marking took place in a month concerned* / *Total number of failures,in case of which the removel of marking took place in a month concerned*

Source: own elaboration.

Attention should be focused on the fact that most of the objectives and key performance indicators defined at the level of specific processes refer to specific values associated with the technological nature of the water supply process. The design of the performance management system in the water and sewerage company then required the specialist expertise of the technological processes being implemented.

At the time of setting the goals and planning the key performance indicators, special attention was paid in order to give specific characteristics to all the defined measures. The key issue was to formulate the objectives at lower levels of management and to design performance measures in such a manner so that people responsible for a given process could affect the achievement of such a goal and the assigned value of the measure. It was hard to comply with this standard because it was often proved that the achievement of the goal pursued depends not only on the actions and decisions of a given process owner but also on other process owners. For example, the objective concerning the reduction of failures in the water-supply network assigned to the process owner who is responsible for carrying out operational works within the water-supply network can be met as a result of correct network operation, that mainly depends on the person liable for this process, but also in connection with the large-scale investment programme. Preparation of the investment plan does not fall within the competencies of the process owner who is responsible for carrying out operational works within the water-supply network but it is in the scope of responsibility of the process owner connected with the analysis of technical condition of the water-supply system and intakes. As a result of team work, during training, it was possible to design the key performance indicators in such a way that they mirrored, to a large extent, the direct

Table 2. Exemple of KPI card in the water and sewerage company

Name of the main process: Water supply	
Name of the specific process: Carrying out maintenance works within the water-supply network	
Name of KPI: Indicator of failures in water-supply chain and the length of the network	**Calculation frequency:** quarterly
Date of implementation: 1 January 2014	**Date of last KPI modification:** ---
Significance of KPI*: 1	
General objective: Reduction of failures in the network	
The formula to calculate KPI: $\frac{\textit{The number of failures in water-supply network during the last four quarters}}{\textit{Total length of the network aged above 20 years (in km)}}$	
Characteristics/interpretation of KPI: Decrease in value of the indicator shall mean improvement of efficiency of operational tasks	
Critical success factors: Improvement of planning operational works More efficient maintenance of devices within the water-supply system	
Data source to calculate KPI: GiS application.	
Current value of KPI: 2	**Desired value of KPI:** 1
Person responsible for KPI: Jan Kowalski	**Person approving KPI:** **Jan Nowak**

Source: own study.

input of both owners of the mentioned processes into a reduction of the number of failures within the water-supply network. The owner of the process related to the operation of water-supply network primarily assumes responsibility for the failures within the network aged above 20 years, that is the network which does not come from the newly completed investments. The owner of this process cannot achieve the goal assigned to him/her in connection with investments for which a different process owner is liable (the process referring to the analysis of the technical condition of the water-supply and intakes network). Similarly, the owner of the process connected with the analysis of the technical condition of the water-supply and intakes network is primarily responsible for effective and efficient investment planning. This is reflected in the formulated measure which refers to the number of places selected for carrying out renovations and investment of the network to the number of failures which took place in a given quarter beyond these places. Through adequate planning of key

performance indicators it was possible to attribute liability for their direct activities to the owners of processes mentioned-above, which together improve the technical condition of the water-supply system, including a reduction of the generated failures.

Appropriate cards have been developed for all designed Key Performance Indicators (KPI). An example of such a card for one of the measures is presented in Table 2.

Following the determination of the objectives and key performance indicators (KPI), their desired values were specified. These values should have been achieved by individual process owners over a long time. The desired values of indicators were defined on the basis of benchmarking analysis. Then reporting systems were designed on the basis of the achieved values of the performance measures which were the subject of analysis and discussions of process owners with the management board of the company. The achieved results were analysed and discussed quarterly. In the case of the key performance indicators (KPI), the values which were approaching the defined numerical goal of their desired values were verified at a more challenging level. Such an approach allowed the company to constantly improve business operations.

4. Conclusions drawn from designing and implementing the performance management system in the water and sewerage company

In the course of designing and implementing the performance management system in the water and sewerage company some weaknesses also became apparent, including:

- key performance indicators (KPI) are one/two dimensional while most problems occurring in the company are multidimensional,
- key performance indicators (KPI) do not take into account the capital dimension, which affects economic performance of many decisions,
- employees prefer key performance indicators (KPI) oriented towards measuring the level of performed work not achieved results,
- division of critical success factors relating to the defined goals and key performance indicators between different process owners (for example the number of failures depends on the technical analysis of the network and efficiency of performing operational tasks) which is reflected in difficulties to distinguish between the responsibility for achieving the goal and the numerical value of the measure,
- lack of sufficient data to calculate some key performance indicators (KPI) particularly when referring to the time of execution of these activities.

The first and second constraint of the performance management system are essential. For example, the objective concerning reduction of failures within the water-supply network analysed before, can be achieved in various ways; through the more efficient operation of network, maintenance of devices included in the network, better investment and renovation planning, finally through increasing the expenditure to modernise the network. The key performance indicator is very often only a quotient

of two figures and it does not contain all the important aspects related to achieving the objective. Moreover, the above mentioned objective may be attained through replacement of the entire water-supply network. Such an action would be absurd from the economic point of view, although it would generate the key performance indicator of excellent value, defined as the quotient of the number of failures within the network and the length of the network (value of this indicator would be zero). The analysis based on indicators such as NPV, IPR would certainly show the lack of justification for such investment referring to the water-supply network. Key performance indicators leave aside the fact that to achieve an objective or a planned value of measure, a high level of investment expenditures should be incurred. The lack of the capital dimension in key performance indicators (KPI) may cause the process owners to make irrational decisions from the perspective of creating values for holders of company's shares or stocks.

During training, the employees aimed to define the performance measure in such a way that it was focused on the amount of work they performed, not on the achieved results which also proved to be a major issue in designing and implementing the performance management system. For example, the employees responsible for collection of overdue receivables preferred the key performance indicators defined as the quotient of the number of payment requests sent and the number of clients in arrears with payments. Any indicator formulated in such a manner is completely incorrect as it does not measure the efficiency of collecting overdue receivables. Such an indicator does not motivate employees to act effectively. It was replaced with the indicator being a quotient of the value of overdue receivables collected per month and the status of overdue receivables at the beginning of the month. The measure designed in this manner will orientate employees' activities towards the effects of the performed work.

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