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## Article

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## Do we need a new compass for the journey through the global crisis?

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**Abstract:** In 2010, Luka Koper port and logistics system celebrated its 53rd anniversary. From being a small local port they have developed into the significant port and logistic system - European Logistics and Distribution Centre Luka Koper, d.d., in the Adriatic and European maritime market. The main purpose of this paper is to present the development of the management system. Luka Koper, d.d. was recognized for Excellence (R4E) in the 2005 and finalist in the 2006 Excellence Award (EEA) process. Within this research we stressed the importance of the influence of process key performance indicators (KPIs) on the business results of the company through the EFQM model harmonization. The case of a company which is regularly and systematically accomplishing the Supervisory Board resolution about business management model harmonization with the principles of the EFQM model is very rare in Slovenia. From the literature review we have not found any similar case study research. Qualitative and quantitative analysis indicates the general benefits of the KPIs' influence on the business results. In this context, diagnosis and consecutive deeper understanding of the process KPIs' influence on the business results should be the basis for further improvements of the company's performance.

**Keywords:** business model, identification, BSC, improvements, NCCA

## 1 Introduction

The Port of Koper was established in 1957 and celebrated its 53rd anniversary in 2010. The actual name of the company was adopted in 1961. From a small company they developed into the significant port and logistic system - European Logistics and Distribution Centre Luka Koper, d.d., in the Adriatic and European maritime market. Luka Koper, d.d. of today is an exceedingly successful and rapidly developing company, which is founded on their adopted values: knowledge, enterprise, partnership, responsibility and respect. Luka Koper, d.d. was the winner of the Slovenian national quality award (PRSPQ) in 2002 (MIRS, 2005). The company was also recognized for Excellence (R4E) in 2005 and finalist in the European Excellence Award 2006 (EEA) (EFQM, 2006).

With the European Foundation for Quality Management (EFQM) model integration in management system, the company develops a holistic measurement system, continuous improvements, self-assessment, benchmarking, inter-organizational learning and good practice transfer. The EFQM model is usually implemented with the pilot project. The most frequent purpose for such an approach is linked to participation in the national quality award (NQA) process. Through the self-assessment process, the company ascertains the improvement opportunities which are in this manner subject to 'competition rules'. But this is not the most appropriate combination because self-assessment, by its nature, is not intended to be influenced by the 'competition rules' in the NQA process.

The EFQM model, when used in practice, shows that it is difficult to determine transparent relations of enablers (causes) with business results (effects). Connecting approaches are undefined (Babič, 2007; Brunklaus, Malmqvist, & Baumann, 2009; Križman & Novak, 2002) and the problem lies in the structure of the model (Conti, 2007). Self-assessments of the model adapted to the company, do not give appropriate information to the management, in order to make transparent relations of the process KPIs' to results and goals respectively.

However, the implemented model does not enable the identification of all information on the relations (correlations) between process Key Performance Indicators (KPIs) and the business results i.e. key performance results (KPRs). In this manner the company does not have transparent evaluation of resource inputs in efficiency of the implemented EFQM model in the management system.

Diagnostic activities, in this context, are usually 'too expensive' for the company and its usually overworked employees. Because of the latter's outlook, diagnostics is regarded as being a time-consuming activity. With the development of a model for identification of the influential process KPIs which makes an important contribution to the KPRs, the company can perform its own diagnostic activities and focus on improvements of the key processes in a short and long-time period.

Analysis of documents and records, semi-structured questionnaires and process KPIs values indicates the latter's significant influence on the business results. On the basis of the analysis carried out, we conclude on the importance of the observed variables (KPIs) and their cause-effect relations which are monitored in the frame of the EFQM model and more closely in the four perspectives of business performance (BSC). Our research makes a contribution to the performance evaluation and sheds some light upon the relations between the KPIs. We extended our research on the KPIs achieved values and evaluation of the explained variances and correlations between them. In this way we enabled the introduction of one of the methods for quantitative balance evaluation of the company performance indicators. The constructed model also allows for experimentation and in consequence improvements of the KPIs' sets in the short and long-term.

Qualitative and quantitative analysis of many researches into excellence model implementation, performed all over the world e.g. Australia, China, EU, New Zealand, and USA, indicates the general favorable influence of KPIs' influence on the KPRs of organizations (Boulter, Bendell, Abas, Dahlgaard, & Singhal, 2005; Eriksson & Hansson, 2003; Hausner & Vogel, 1999; Hendricks & Singhal, 2000; Mann & Saunders, 2005; Mann & Grigg, 2006; Miyagawa & Yoshida, 2005; PWHC, 2000).

## **2 Business excellence model**

The EFQM model was developed at the beginning of the 1990s, and introduced to the public at the EFQM Forum 1991 in Paris. The first European Quality Award, actual EFQM Excellence Award (EEA), was presented over in 1992 (Conti, 2007). The Slovenian first pilot project of National Quality Award (PRSPO) was accomplished in 1996, and the first award was presented over in 1998. The government of the Republic of Slovenia in its strategic plan and measures program

(2007 - 2013) highlighted the support to the implementation of the EFQM model in Slovenian companies (Šuštaršič, 2005; Vizjak, 2007).

The EFQM model is founded on self-assessment, likewise as in other excellence models around the world, e.g. Malcolm Baldrige NQA (MBNQA) in USA, Deming Prize (DP) in Japan, Australian Business Awards (ABA) in Australia or Canadian Framework for Business Excellence (CFBE), (BQF, 2007.; Bou-Llugar, Escrig-Tena, Roca-Puig, & Beltran-Martin, 2003; Boys, Wilcock, Karapetrovic, & Aung, 2005; Leonard & McAdam, 2002). Self-assessment contains regular activity review and identification of active inertia in every area of organization's activity (Karapetrovic & Wilborn, 2002; Savič, Kern Pipan, & Gunčar, 2007) against the nine criteria of the EFQM model (Figure 1) (Conti, 1998; MIRS, 2004).

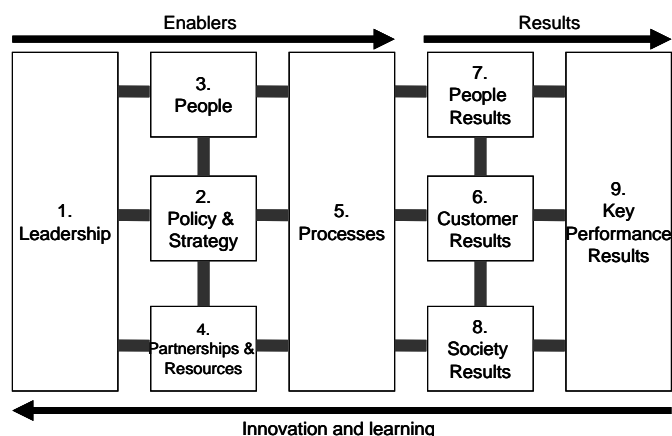


Figure 1. "Model EFQM (European Foundation for Quality Management)".

Source: Dolinšek et al. 2006, MIRS 2008, ® EFQM 2008

The first five criteria represent enablers and the last four criteria represent results of the organization. Enablers tell what the organization is doing; meanwhile, results indicate what the organization achieves. In such a manner results are the consequence of enablers, and enablers are improved on the basis of 'feedback information' basis from the results. The model enables many approaches for the achievement of excellence from all viewpoints of organization activities. Excellent results in key performance, customers, people and society are achieved with leadership, which is the driving force of policy and strategy, people, partnerships and resources. Arrows in Figure1 indicate the dynamic nature of the model (Dolinšek, Piskar, Faganel, Kern Pipan, & Podobnik, 2006; EFQM, 2008).

Self-assessment should be triggered from the management board when the company defines key strategic objectives. Triggering should be ended with the list of objectives which have the highest priority. At the same time the list of objectives and priority tasks constitutes the framework of the self-assessment process (Conti, 1998). The EFQM model is applicable also to the definition of the Total Quality Management (TQM) philosophy. In that way, it represents help in fostering TQM on the part of the management board (Bou-Llusar et al., 2003; Eriksson & Garvare, 2005; Feigenbaum, 1991; Mangelsdorf, 1999; van der Wiele, Williams, & Dale, 2000; van der Wiele et al., 1996).

American research into effective implementation of the management paradigm-TQM and its impact on the financial results, of 600 quality award winners, showed that all of them achieved significant improvement in stock returns, operating income, sales, total assets, employees, return on sales and return on assets.

A sample of recipients of independent quality awards (MBNQA) was compared with a sample of customers award winners (e.g. Chrysler, Ford, Texas Instruments, etc.), which operate in the same area. Hendricks and Singhal's (2000) research ascertains that the achieved success in business results of the independent award winners is significantly greater (Hendricks & Singhal, 2000; MIRS, 2004).

In Europe, EFQM and BQF organizations sponsored the research for the identification of the correlations between adopted principles of the EFQM model and improved business results (Boulter et al., 2005). A sample of 120 quality award winners (i.e. EFQM, BQF, National Partner Organizations NPO) was selected. A sample of companies for comparison was selected on the basis of: the same country of incorporation as the parent company, the same accounting data available over the same period and its closest total assets size measures. Research showed business performance improvement in the short and long-term for the companies which effectively implemented the principles of the EFQM model (Boulter et al., 2005).

Results of a research study by the PriceWaterHouseCoopers Company on a sample of 3500 public sector organizations in the UK indicated that the tool for continuous improvements' implementing is the EFQM model in 56%. The main reasons for using the EFQM excellence model are identification of improvement opportunities in 84% and self-assessment in 78% (PWHC, 2000).

Research, in the EU northern region, conducted by Kristensen, Juhl and Eskildsen (as cited in Kristensen, Juhl, & Eskildsen, 2001) showed that Danish companies who applied the Danish Business Excellence Index are achieving significantly better results than other companies (Kristensen et al., 2001). The Swedish Institute for Quality performed equal research for the Swedish companies which showed similar results (Eriksson & Hansson, 2003; Eriksson, 2004).

Likewise the results of research in Australia, New Zealand and China confirmed the positive effects of systematic application of the excellence model (Hausner & Vogel, 1999; Mann & Saunders, 2005; Mann & Grigg, 2006; Miyagawa & Yoshida, 2005).

The influence of excellence models' implementation on companies' results in the EU and wider has been relatively well researched, meanwhile in Slovenia this kind of research is rare. Winning the Slovenian PRSPO means receiving the highest national quality award of the Republic of Slovenia, which is based on the EFQM model.

Research into registered competitors in the framework of Slovenian PRSPO and comparative data from the EEA has shown that the main motives and benefits of the EFQM model application in the EEA frame are self-assessment, benchmarking, employee engagement and feedback information. Meanwhile the Slovenian PRSPO competitors have emphasized excellence as a part of the strategy, continuous improvements and good practice exchange (Kern Pipan, 2007). Benchmarking results by criteria showed that Slovenian organizations have the greatest improvement opportunities in people management in the organization and outside of it (i.e. customers, partners, companies) (Skubic & Kern Pipan, 2006).

Adaptation of the EFQM model to the company and its capabilities (Conti, 2007; Kovač & Kern Pipan 2005; Piskar & Dolinšek, 2006; Savič et al., 2007), with regular usage of self-assessment (Kern Pipan, 2007; Samuelsson & Nilsson, 2002; Skubic & Kern Pipan, 2005; van der Wiele et al., 1996) is essential for the successful companies. Model application should contribute added value to improvements of all company activity areas, i.e. from service, manufacturing, marketing up to supply (Brunklaus, Malmqvist, & Baumann, 2009; Sheth, 2007) with adapted EFQM criteria adapted to the company at all management levels.

Prestigious award winners' cases all over the world confirm that organizations with systematic use of tools for continuous improvements achieve lasting operational excellence. In Slovenia we have, after more than a decade of PRSPO existence, some cases of excellent companies which have achieved exceptional success also on the European level and placement among the EEA finalists. These are: Hermes Softlab, d.d., in 1998, Luka Koper d.d. in 2006, and Trimo Trebnje d.d. in 2007.

In the last 18 years the EFQM model has shown validity in excellence recognition, as an informal organizations' assessment 'standard' and consecutive benchmarking between different organizations (Conti, 2007). In this segment, the excellence project represents an important contribution to the measures for carefully planned operations, quality increasing as well as assurance for a uniform platform for benchmarking and understanding the business excellence achievement in the EU space and wider.

### **3 Purpose and objectives of the research**

Problem identification: In spite of numerous studies and researches on the EFQM model implementation, the approaches for determination of transparent relations between enablers and results are still difficult to establish (Babič, 2007) and are dependant on the structure of the EFQM model. According to T. Conti (1998) and T.A. Conti (2007) this should be the subject for further research.

Likewise in Luka Koper, d.d., they miss greater connectedness between KPIs and strategic directions. Large emphasis is placed on financial data, and on the existence of too extensive surveying of data which are easier to measure and are likely less important. Comparison of benefits in the form of improvements to approaches, better market and financial results and investments in quality tells us what kind of quality management the company has (Babič, 2007; Brunklaus, Malmqvist, & Baumann, 2009).

#### **3.1 Purpose of the research**

The main purpose of the research was to establish if is possible to set up an adequate model for identification of the process KPIs which have a significant influence on the business results.



### 3.2 Objectives of the research

Based on the problem identification and purpose of the research, the following specific objectives were defined: (1) Determination of the sets of process KPIs and sets of results KPRs, (2) Determination of the cause-effect relations between process KPIs and KPRs. (3) Identification of influential process KPIs which make an important contribution to the key performance results (KPRs) of the company. (4) Setting up the model for identification of the KPIs in correlation with the results of the company.

### 3.3 Methodology

The paradigmatic orientation of this research is quantitative, because the influence of the process KPIs on the company's results is discussed. As a research method, case study was chosen (Gummesson, 2000; Ivanko, 2007; Yin, 1994) based on the following criteria: (1) Self-assessments have been performed regularly since 1999. (2) Participation in PRSPO competitions (Winners of the PRSPO in 2002) and (3) EEA participations (R4E in 2005 and Finalist in 2006). (4) The company has implemented many standards and models since 1994 (i.e. ISO 9002, EFQM, ISO 14001:2004, ISO 9001:2008, HACCP, NON GMO Certification, ISO 22000:2005, BS OHSAS 18001:2007, and BSC). (5) One of the requirements for the standard of quality management system ISO 9001 is to determine the sequence and relations between business processes (MIRS, 2000, p. 11).

The selected criteria are based on facts. The first fact is that all self-assessments by the EFQM model have been performed regularly since 1999 (MIRS, 2003; Oakland, 2004). The second fact is participation in the PRSPO competition process for three times, which was also a condition for EEA participation. And the third fact is participation in EEA competition, which reflects the maturity of the company's management system, and a request for feedback information from the EFQM independent assessors. The final and fourth fact is the integrated management system which has been built systematically built up since 1994.

Study of the documents and records is the basis for understanding the company's performance. Documents and records were studied closely and included analysis of public available data from application reports for PRSPO and EEA competitions, web sites and annual reports of the company. Observations were performed during

research which is still being continued. A semi-structured interview questionnaire was based on the EEA 2006 report (Luka Koper, 2006b) and divided into nine sections in accordance with the nine criteria of the EFQM model. Some questions were open and some questions consisted of a scale from 1 (poor) to 5 (excellent). In all sections of the questionnaire the interviewees could express their comments (Kvale, 2007). Answers were analyzed qualitatively (Gummesson 2000) and quantitatively with the Factor Analysis method (Harman, 1976; Hair, Black, Babin, Anderson & Tatham, 2006). Eleven employees who participated in the interviews were mainly from the middle management level and some experts. Interviewees were also members of the EEA 2009 project team which is acquainted with the EFQM model and its terminology (Eriksson & Garvare, 2005, p. 899; Yin, 1994, p. 78–80). Interviews were performed in May and June 2008 and served as an auxiliary method for gathering data about KPIs which were analyzed with the Nonlinear Canonical Correlation Analysis (NCCA) multivariate method for a period of three years.

## **4 Empirical findings and discussion**

### **4.1 Members of the EEA project team**

Projects are unique and time limited and so too is the project team. Members of the company's EEA project team were chosen on the basis of their areas of competences regarding the EFQM model criteria and resources for the project performance (Lientz & Rea, 1999; Liang, 2003; Heldman, Baca & Jansen, 2005). Contents contributions of the EEA self-assessment report were in harmony with the weighted EFQM model criteria factors. Those contents were from the areas of leadership, policy & strategy, human resources management, marketing, key processes, quality, finance, accounting and controlling and partnerships & resources.

### **4.2 Analysis of documents and records**

On the basis of strategic guidelines, key areas of activity and sets of processes, we identified the key business processes which significantly contribute to the business results of the company. For the basic set of business processes indicators we have set up a table of indicators. The latter has been drawn up from a review of applications for the national quality award PRSPO in Slovenia and the EEA at the

European level. In this table are 79 indicators, which are broken down by years of monitoring and EFQM model criteria.

With the analysis of documents and records we meet the first research objective: determining the sets of process KPIs and sets of results KPRs according to the EFQM model. Here it must be pointed out that the company still has a number of indicators which are stated in the applications for EEA and are defined in the documents of the company's management system. The company does not reveal these KPIs to the public and they were not available in this research. In addition, we were allowed to publish only those KPIs that represent the company performance in their annual reports (Luka Koper 2005, 2006a, 2006b, 2007, 2008a, 2008b, 2009).

#### 4.3 Cause and effect relations among criteria

Qualitative analysis was performed with the comparative method between EFQM model, EEA 2006 report, answered questionnaires, interviews and observations. Among the methods available to the researcher, qualitative interviews and observation provide mostly the best opportunities for the study of business processes (Gummesson, 2000).

EFQM Criteria (Section)	Relation with criteria and/or sub-criteria
1. Leadership	2., 3., 4., 5.
2. Policy & Strategy	3., 5., 6.a, 7., 8., 9.
3. People	1.b, 3.a, 3.b, 3.c, 3.d, 5.a, 7.a.
4. Partnerships & Resources	2.b, 3.b, 3.e, 4.c, 4.d, 4.e, 8., 9.
5. Processes	2.a, 3.c, 3.e, 4.a, 5.e, 6.a, 7., 8.b, 9.a.
6. Customer Results	9.a.
7. People Results	3.
8. Society Results	2.a, 8.a, 8.b.
9. Key Performance Results	9.a, 9.b.

Table 1. "Cause and effect relations".

We analyzed relations between all 32 sub-criteria of the EFQM model. In Table 1, are represented relations at the level of EFQM model criteria.

The first finding of the qualitative analysis on the basis of relations between sub-criteria and criteria of the EFQM model is that the relations are clearly expressed (Table 1). Recognized relations fall within the context of relations to be recognized by the external assessors from the EFQM model and, to some extent, the sources of MIRS (2006, p. 29–40; EFQM 2008). Some of the relations are obvious and are

to be found in many organizations that applied the EFQM model, but always organizations have some relations that are unique for them (MIRS, 2006). Organizations adapt the implemented EFQM model to their management system characteristics and capabilities (MIRS, 2000; Kovač & Kern Pipan, 2005; Piskar & Dolinšek, 2006; Conti, 1997; Conti, 2007). Therefore we can conclude that they constitute evidence of good business management.

The second finding is that the perceived opportunities for improvement in all areas of business and the important projects resulting from the findings of (self-) assessments are in place and active. Those are: Benchmarking, BSC, the extension of the first pier, managing land terminals which are linking Koper Bay with Central and Eastern Europe and becoming the railway operator. Through the implementation of improvement opportunities, influence is exerted on many areas (criteria) which could be monitored with the red threads (Red threads are themes which represent linkages through the EFQM model. The list of themes is changeable and differs between the organizations.). The influence of improvement actions is, in this context, the impacting of many of the sub-criteria. That shows the complexity of the relations between them and represents an issue for further research. Beside the company, red threads are the area of interest also for external assessors which consider the demonstrated relations expressed in the PRSPO or EEA reports.

The third finding is that knowledge and understanding of the EFQM model, at the time of analysis, was not at a very high level. This could be the consequence of the company's rapid international (EU and wider) expansion at that time. The fact is that Slovenia became 'too small' for Luka Koper, d.d. Regarding this, the employees have less time at their disposal for systematic and deeper acquaintance with the EFQM model and its complex relations. This statement could be tied to the research of Eriksson and Garvare (2005, p. 901–902, 909) and the findings of Janeš and Faganel (2008, p. 13) who all allege similar difficulties: overworked employees, requirement of a great deal of resources and time consuming activities.

Questionnaires were completed by the interviewees mainly before or after the interview. All questionnaires were also returned. For the analysis, ten returned questionnaires were used. They were analyzed qualitatively and quantitatively with the statistical method of Factor Analysis in the SPSS for Windows standard

statistical software. On the basis of comparative method findings we achieved the second research objective: determination of cause and effect relations between process KPIs and KPRs (Kaplan & Norton, 2006, p. 6–8).

#### 4.4 Discussion on the basis of the Factor analysis

The first finding based on the KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) statistics is that the largest part of the used data was under the relatively great influence of the specific factors. Namely, most of the observed variables are within a relatively large influence of specific factors because of  $KMO < 0.5$  (criteria from 1 to 4 and 6 to 9). But somehow the variables of section 5 Processes are quite suitable for factor analysis. At this point it should be mentioned that some questions or parts of questions in the returned questionnaires were left unanswered. The influence of those data is probably reflected in the factor analysis solution.

The second finding based on the evaluation of communalities is that most of the considered variables are good indicators because their values were greater than 0.5 in 62.68 % of variables (42 of 67 considered variables).

And the third finding about the explained variance percentage is that the selected factor models were relatively good because eight out of nine criteria explain the variance with approximately 61 % to 77 %. And only in the case of Leadership criteria we did have a solution with one factor which explains variance with 59 %.

Factor loadings evaluations, Eigen values, Scree Plots and criteria contents lead us to a two factor model solution for criteria: 1 to 4 and 6 to 9. Factors loadings were evaluated with the Maximum Likelihood or Principal Axis Factoring method with the Varimax rotation. One factor solution was achieved with the Principal Axis Factoring method, which was the case of criteria 5 Processes.

In Table 2 are represented latent factors from the factor analysis solution of the criteria from the questionnaire sections. The main picture, consisting of all factors from the solution, is confirmation of the business model harmonization with EFQM model principles. This supports the achievement of the second objective of the research: cause-effect relations between process KPIs and KPRs. Factors from the solution confirm the results that were demonstrated in the EEA report, annual reports and web site of the company.

Quantitative analysis findings of the semi-structured interviews are represented according to the EFQM model criteria (sections) beside the Cronbach's Alpha reliability in Table 2 below.

Criteria (section)	Factor	Variance Cumulative %	N of Variab.	Cronbach's Alpha
1. Leadership	F1.1 transfer of leadership enablers on employees effectiveness, F1.2 leaders qualification effectiveness	59,25	8	0,62
2. Policy & Strategy	F2.1 strategies and key processes effectiveness, F2.2 organization strategies deployment effectiveness	67,35	7	0,61
3. People	F3.1 employee involvement effectiveness, F3.2 qualification and education effectiveness	70,54	8	0,73
4. Partnerships & Resources	F4.1 consciousness about technologies, F4.2 organizational changes	74,18	9	0,62
5. Processes	F5 processes development approach effectiveness	60,72	6	0,84
6. Customer Results	F6.1 customer relationships management effectiveness, F6.2 service segments effectiveness	67,25	5	0,27
7. People Results	F7.1 employee empowerment effectiveness F7.2 good practices deployment effectiveness	74,22	7	0,80
8. Society Results	F8.1 collaboration with society effectiveness, F8.2 market and media promotion effectiveness	77,21	7	0,52
9. Key Performance Results	F9.1 process effectiveness, F9.2 policy and strategy effectiveness	71,83	7	0,72
Sum	17 factors	-	64	0,91

Table 2. "Solutions of the Factor Analysis". Source: Dolinšek and Janeš 2008

#### 4.5 Identification of the influential process KPIs

In the framework of the EFQM model, we observed process performance indicators which have been divided between the enablers and results. However, the results of our research show that there are only indicators of business processes to monitor enablers and the results of the business performance. In the present case study the company Luka Koper, d.d., identified more than 120 indicators at all levels of management.

Such a great number, of course, becomes difficult to be manageable in the sense of company management. Besides that, the purpose of our research is to set up the model for identification of the key performance indicators which have significant influence on the business results through the relations between them

(Brunklaus, Malmqvist, & Baumann, 2009; Ittner, Larcker, & Meyer, 2003). Similar findings and identification of key performance indicators are also reflected in researches into health, tourism and traffic safety (Bailey, & Hewson, 2004; Bates-Jensen, Cadogan, Jorge, & Schnelle, 2003; Caplin, Rao, Filloux, Bale, & Van Orman, 2006; Colonna et al., 2005; Reddy, 2008; Weekes, Brooks, & Day, 1998). Therefore, in the continuation of the research, all variables are considered as indicators of business processes or KPIs' (Jones, 2009; Kaplan, & Norton, 2006).

NCCA Set	Criteria (section)	KPI (variable)	R <sup>2</sup> (%) O. 2006	R <sup>2</sup> (%) O.Mn. 2007	R <sup>2</sup> (%) N.Mn. 2007	R <sup>2</sup> (%) O. 2008
1	9.a	Operating Revenue OR1	37.51	20.64	41.41	37.13
1	9.b	EBITDA margin EBITDAm1	54.12	3.99	10.13	73.15
1	9.a	Added Value per Employee AV1	53.54	96.82	36.84	73.5
1	9.b	Operating Efficiency OE1	33.35	17.64	37.84	30.59
1	9.a	Return on Sales ROS1	9.65	0.31	30.41	35.47
1	9.a	Revenue per unit RU1	57.59	58.98	6.07	15.42
2	9.a	Total throughput TT2	67.68	14.94	2.37	95.36
2	9.a	Maritime throughput MT2	73.23	14.15	3.59	89.70
2	9.a	Land throughput LT2	88.87	10.32	18.43	41.81
3	9.b	Operating Costs OC3	35.41	25.47	60.54	4.46
3	9.b	Variable operating costs VOC3	41.73	33.2	67.96	2.73
3	9.b	Total costs per unit TCU3	48.31	30.02	22.57	6.43
3	9.b	Number of complaints on billing NC3	8.26	74.31	26.34	22.39
3	8.b	Fuel consumption FC3	57.44	100*	98.83	82.09
3	8.b	Electricity consumption EC3	30.95	7.67	3.57	37.88
3	8.b	Water consumption WACN3	92.33	9.75	3.91	9.73
4	7.b	Number of improvements NIIm4	100*	100*	100*	100*

Note: In 2006 and 2008 the optimal scaling level is ordinal. In 2007 the optimal scaling level is ordinal and multiple nominal and the other is numerical and multiple nominal. Variables marked with \* should be interpret with caution due to high levels.

Term EBITDA stands for earnings before interest, taxes, depreciation, and amortization.

The four sets (perspectives) are: 1st. Financial perspective, 2nd. Customer perspective, 3rd. Internal Process perspective and 4th. Learning and Growth perspective (Kaplan & Norton, 2006, p. 6).

Table 3. "KPIs' explained variance by year".

For setting up and application of the model for the identification of key indicators of the company, we used KPIs which are used for monitoring the implementation of the strategic guidelines from four perspectives. If the EFQM model is viewed as a compass in the everyday operations, then the four perspectives of business performance (BSC) are supporting the monitoring and performance of policy and business strategy of the company on all management levels. Among the KPIs that were accessible, we selected those which are monitored on the level of eight specialized land terminals for cargo handling and are presenting the main activity of the company. KPIs which are being monitored or calculated only at the level of the Luka Koper Group (e.g. earnings per share, return on equity) are omitted from analyses. Namely, for the analyses we used KPIs, which enabled us to establish the



variability between eight specialized land terminals. Sets of selected indicators are represented in Table 3.

#### *Findings and discussion on the basis of the NCC analysis*

With the NCCA method we discussed non-linear relations of four sets of variables (Table 3), on the nominal, and/or ordinal and numerical level (van der Burg & de Leeuw, 1987; van der Burg, de Leeuw & Verdegaal, 1988; Gifi, 1990, p. 217–239, Golob & Recker 2001; Colonna et al., 2005; SPSS, 2008). All observed variables are the key KPIs of eight specialized terminals for handling all types of cargo.

We decided to use the statistical method of Principal Component Analysis (PCA) for determining the minimal number of dimensions needed to represent data sets. On the basis of the PCA scree diagram we decided to use two dimensions for the representation of data sets (Harman 1976, Colonna et al., 2005; SPSS 2008).

<b>General canonical correlations</b>	<b><math>P_1</math></b>	<b><math>P_2</math></b>	<b>Fit</b>	<b>Mean Loss</b>
Analysis and optimal scaling level				
1. Analysis 2006				
Ordinal	1.000	0.667	1.750	0.250
Numerical	0.893	0.665	1.669	0.331
2. Analysis 2007				
Ordinal	0.999	0.667	1.749	0.251
Ordinal and Multiple Nominal	0.997	0.996	1.996	0.004
Numerical	0.937	0.608	1.659	0.341
Numerical and Multiple Nominal	0.989	0.952	1.956	0.044
3. Analysis 2008				
Ordinal	1	0.667	1.750	0.250
Numerical	0.831	0.592	1.567	0.433

Note: Optimal scaling level is: Ordinal, Numerical and/or Multiple Nominal

Table 4. "General canonical correlations, Fit and Mean Loss".

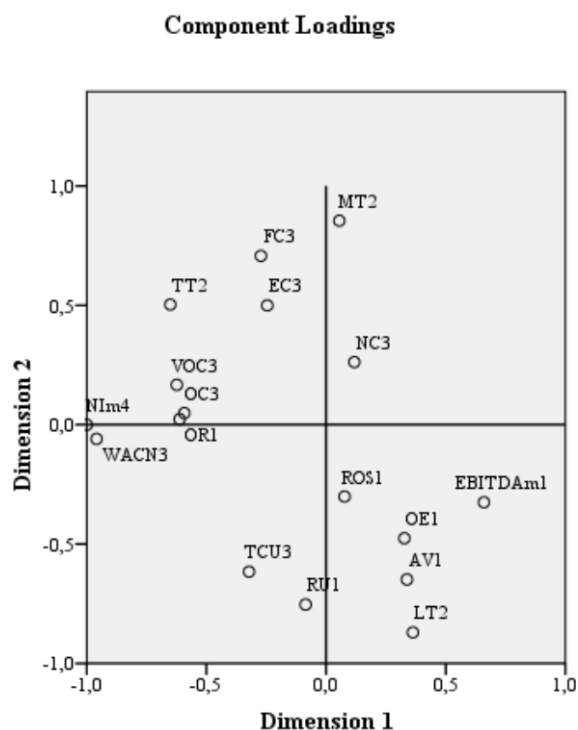
The values of the general canonical correlations, implemented in the period of three years of analyses, are relatively high and rather different. In most, the difference is expressed between the first and second and second and third analyses (Table 4). In addition to the high canonical correlations there are also high Eigenvalues, which show the suitability of the NCCA method (i.e. 2nd analysis 2007 Fit = 1.996 and 1.956). Loss or unexplained variance is relatively evenly distributed among the two dimensions and sets of variables, and is relatively low (i.e 2nd analysis 2007 Loss = 0.004 and 0.044).



For the further analyses of explained variance and correlations between the variables (KPIs), we have chosen the analyses with the highest general canonical correlation and smallest loss which are represented in the continuation.

### 1. Analysis 2006

For 2006 the highest general canonical correlation was demonstrated with the ordinal optimal scaling level. Direction through 1st. and 3rd. quadrant is set by variables (KPIs): maritime throughput MT2 (Explained Variance (EV) 73.23%) and number of complaints on billing NC (EV 8.26%) which are associated with higher values. The latter variables are correlated with a correlation coefficient (CC) of 0.2302.



Note: Abbreviations for variables are explained in Table 3

Figure 2. "Component Loadings 2006 (Ordinal)".

On the other side are, water consumption WACN3 (EV 92.33%), revenue per unit RU1 (EV 57.59%) and total cost per unit TCU3 (EV 48.31%) associated with higher values and opposite-oriented than Maritime throughput MT2. Water consumption

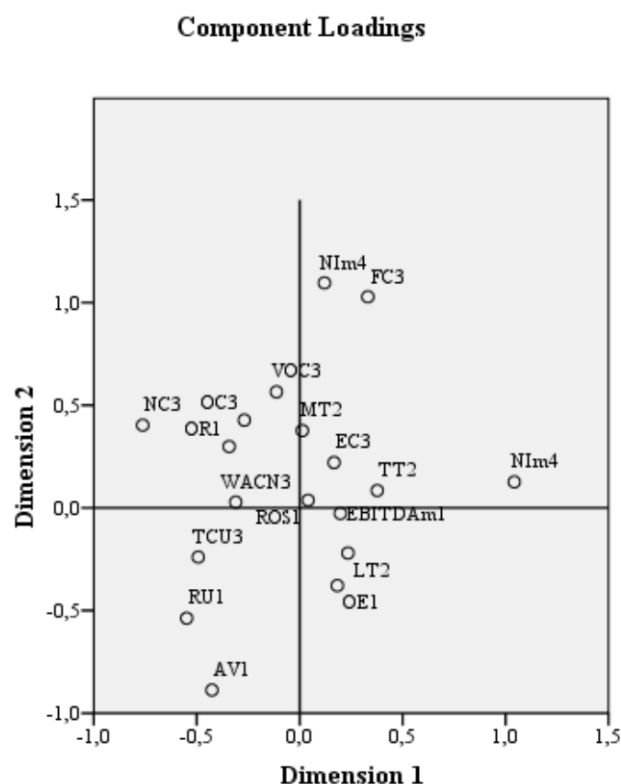
WACN3 and revenue per unit RU1 are correlated with a CC of 0.1277 and water consumption WACN3 and total costs per unit TCU3 are correlated with 0.3458. Revenue per unit RU1 and total costs per unit TCU3 are correlated with a CC of 0.4922. This explains the growth of maritime throughput, reduction of complaints, growth of operating revenue and total costs per unit in 2006 compared to 2005. Consumption of energy sources is equal to or slightly higher than that of previous years (Luka Koper, 2006a, 2006b, 2007, 2008b; Figure 2). In addition, the variable number of improvements NIm4 is aligned with the abscissa and reflects the fact that this is the only variable in the perspective of learning and growth (4<sup>th</sup> set) and has the highest value of Single Loss which is equal to 1. So this variable cannot be reliably explained.

Direction through the 2nd. and 4th. quadrant is set by variables (KPIs): fuel consumption FC3 (EV 57.44%) and total throughput TT2 (EV 67.68%) are associated with higher values, and a CC of 0.5333. Fuel consumption FC3 and variable operating costs VOC3 (EV 41.73%) are correlated with a CC of 0.2884. Fuel consumption FC3 and electricity consumption EC3 (EV 30.95%) are associated with higher values and the CC 0.4200.

On the other side are, the land throughput LT2 (EV 88.87%) which is related to Added Value per Employee AV1 (EV 53.54%), with higher values and a CC of 0.6873, and Land throughput LT2 and EBITDA margin EBITDAm1 (EV 54.12%) with a CC of 0.5223, and Land throughput LT2 and operating efficiency OE1 (EV 33.35%) with a CC of 0.5328. Thus we can explain the consumption of energy sources in 2006 and slightly increased value added per employee, EBITDA and operating costs (Luka Koper, 2007, 2008b). The variable number of improvements NIm4 is aligned with the abscissa and reflects the fact that this is the only variable in the perspective of learning and growth and has the highest value of Single Loss = 1. From the point of view of methodology, it would be appropriate to merge variable NIm4 with other variables from the (fourth) perspective of learning and growth which were not available. For an overview of all correlations between variables (KPIs) of analysis 2006, see Table 5 in Appendix A.

## 2. Analysis 2007

For 2007 the highest general canonical correlation was demonstrated with two analyses, ordinal and multiple nominal, and numerical and multiple nominal optimal scaling level.



Note: Abbreviations for variables are explained in Table 3

Figure 3. "Component Loadings 2007 (Ordinal and Multiple Nominal)".

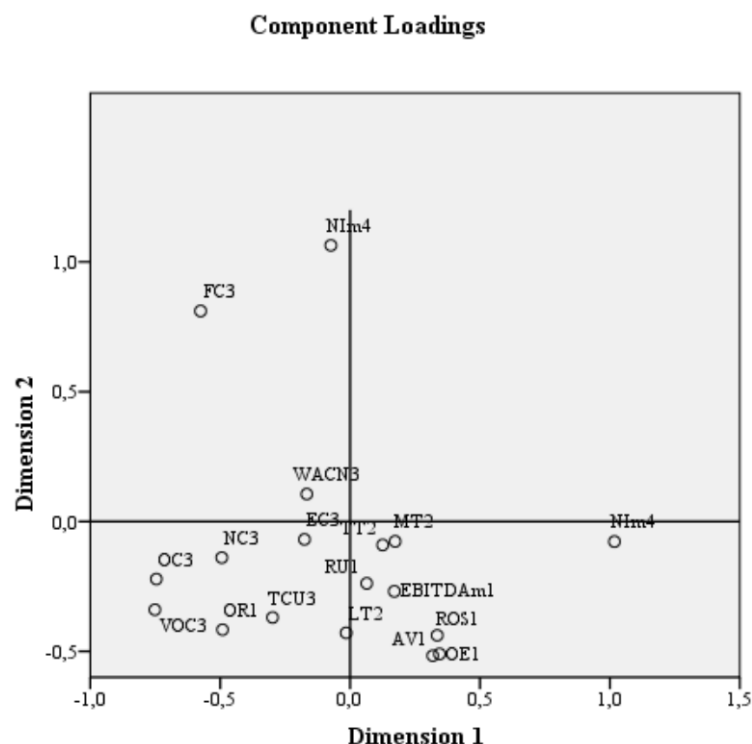
For the ordinal and multiple nominal optimal scaling level, the direction through 1st. and 3rd. quadrant is set by the following variables (KPIs): number of improvements NIm4, Fuel consumption FC3 (both EV 100%\*), which are associated with higher values and a CC of 0.4744 for dimension 1 and 1.00\* for dimension 2, while the number of improvements NIm4 and Maritime throughput MT2 (EV 14.15%) are correlated with a CC of 0.059 for dimension 1 and 0.4135 for dimension 2. Maritime throughput MT2 is associated with lower values with electricity consumption EC3 (the CC between MT2 and EC3 is 0.0851). On the other side are, the added value per employee AV1 (EV 96.82%) and revenue per

unit RU1 (EV 58.98%), which are correlated with a CC of 0.7102. AV1 and total costs per unit TCU3 (EV 30.02%) are correlated with a CC of 0.4220. All these variables are associated with higher values. Displayed variables (Figure 3) explain the increased fuel consumption in 2007 as well as maritime throughput, added value per employee and operating costs, compared to 2006.

Direction through the 2nd. and 4th. quadrant is set by variables (KPI's): Number of complaints on billing NC3 (EV 74.31%), variable operating costs VOC3 (EV 33.2%; NC3 and VOC3 are correlated with a CC of 0.3138) and operating costs OC3\* (EV 25.47%; NC3 and OC3\* are correlated with a CC of 0.3771) are associated with higher values.

On the other side are the Operating Efficiency OE1 (EV 17.64%) and Land throughput LT2 (EV 10.32%; OE1 and LT2 are associated with a CC equal to 0.1260) which are associated with higher values. The variables in Figure 3 explain the decline in the number of complaints, increase in operating efficiency and land throughput compared to 2006 (Luka Koper, 2008a, 2008b). The results of calculation in this case are certainly more reliable, due to the chosen optimal scaling level and calculated Fit (Table 4). In this case, the relations between the variables, taken into account in the calculation, are treated as a non-linear, which is in practice more likely. For an overview of all correlations between variables (KPI's) of analysis 2007, see Table 6 in Appendix B.

For the *numerical and multiple nominal optimal scaling level*, the direction through 1st. and 3rd. quadrant is set by the following variables (KPIs): The number of improvements NIm4 has higher values and is the only indicator in the 1st. quadrant (EV 100%\*). On the other side, in the 3rd. quadrant are variables, variable operating costs VOC3 (EV 67.96%) operating costs OC3\* (EV 60.54%; VOC3 and OC3 \* are correlated with a CC of 0.6354) and operating revenue OR1 (EV 41.41%; VOC3 and OR1 are correlated with a CC equal to 0.5102) which are associated with higher values. Figure 4 represents variables which explain the increase in revenues and costs, as in the year 2007 fuel consumption as well as maritime throughput were increased compared to 2006.



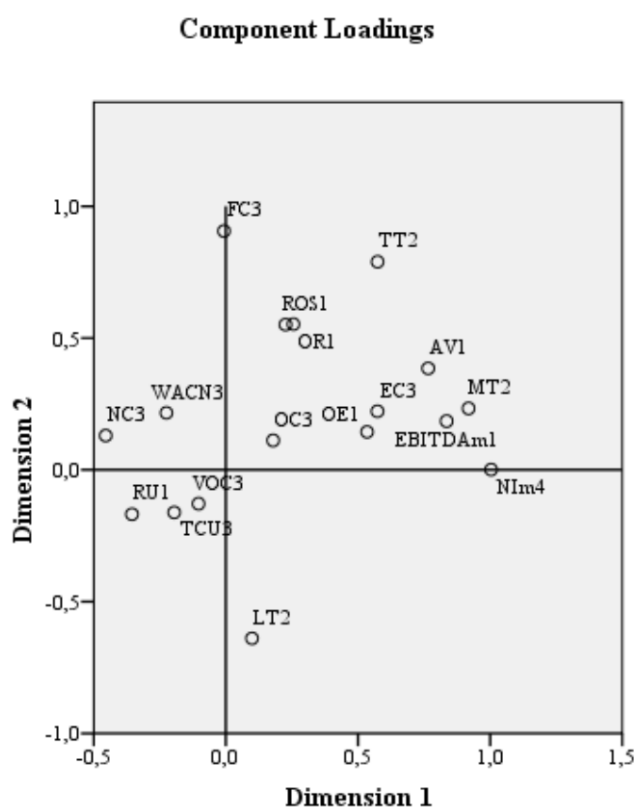
Note: Abbreviations for variables are explained in Table 3

Figure 4. "Component Loadings 2007 (Numerical and Multiple Nominal)".

The direction through the 2nd. and 4th. quadrant is set by variables (KPIs): The Number of improvements NIm 4 (EV 100%\*) and Fuel consumption FC3 (EV 98.83%; NIm4 and FC3 are associated with a CC of 0.9055 for dimension 2) are associated with higher values. On the other side of the direction are: the Added Value per Employee AV1 (EV 36.84%), Operating Efficiency OE1 (EV 37.84; AV1 and OE1 are associated with a CC of 0.3731) and Return on Sales ROS 1 (EV 30.41%; AV1 and ROS1 are associated with a CC equal to 0.3330) which are associated with higher values. The variables the Figure 4 explain the increase in Added Value per Employee, Operating Efficiency and Maritime throughput, compared to 2006 (Luka Koper. 2008a, 2008b). They are also subject to the necessary assumption that with the numerical optimal scaling level, relations between variables in the calculation are considered as linear. For an overview of all correlations between variables (KPIs) of analysis 2007, see Table 7 in Appendix B.

### 3. Analysis 2008

For 2008 the highest general canonical correlation was demonstrated with the ordinal optimal scaling level. The direction through the 1st. and 3rd. quadrant is set by variables (KPIs): Total throughput TT2 (EV 95.36%), number of improvements NIm4 (EV 100%\*; TT2 and NIm4 are correlated with a CC of 0.5771), maritime throughput MT2 (explained variance 89.70%; TT2 and MT2 are correlated with a CC of 0.7110) and Added Value per Employee AV1 (EV 73.5%; TT2 and AV1 are associated with a CC, which is 0.7438) are associated with higher values.



Note: Abbreviations for variables are explained in Table 3

Figure 5. "Component Loadings 2008 (Ordinal)".

TT2 correlations with other variables in the 1st. quadrant are: with the EBITDAm1 0.6254, with OR1 0.5838, with ROS1 0.5650, with EC3 0.5049, with OE1 0.4203 and OC3 \* 0.1912.

On the other side of the direction are, the Revenue per unit RU1 (EV 15.42%), Total costs per unit TCU3 (EV 6.43%; RU1 and TCU3 are correlated with a CC equal to 0.0966) and Variable operating costs VOC 3 (EV 2.73%; RU1 and VOC3 are associated with a CC equal to 0.0582) are associated with higher values. The variables in Figure 5 explain the decline of certain operating costs and increase in some operating costs (logistical and transport costs), maritime throughput, operating revenue and added value per employee, compared to 2007 (Luka Koper 2008b, 2009).

The direction through the 2nd. and 4th. quadrant is set by variables (KPIs): Fuel consumption FC3 (EV 82.09%), Water consumption WACN3 (EV 9.73%; FC3 and WACN3 are correlated with a CC of 0.1973) and the Number of complaints on billing NC3 (EV 22.39%; FC3 and NC3 are correlated with a CC of 0.1210) are associated with higher values.

On the other side of the direction, associated with higher values, are the following variables: Land throughput LT2 (EV 41.81%) and Number of improvements NIm4 (EV 100%\*; LT2 and NIm4 are correlated with a CC of 0.0988). Variables in Figure 5 explain the increase in fuel consumption (consumption of energy sources for maritime throughput volume and the increase in fuel prices), and a decline in the number of complaints and its own water consumption. In addition, the variable number of proposals for improvement NIm4 is aligned with the abscissa, reflecting the fact that this is the only variable in the perspective of learning and growth and has the highest value of Single Loss = 1. For an overview of all correlations between variables (KPIs') of analysis 2008, see Table 8 in Appendix C.

On the basis of the analysis carried out, we conclude on the importance of the observed variables (KPIs) which are monitored in the frame of the EFQM model and more closely in the four perspectives of business performance (BSC). Namely, the length of the vectors from the origin to the coordinates (Figures 2 to 5) of each variable indicates its explained variance by all the other variables (the square of length being equal to the percent of variance). The scalar product between any two observed variables indicates the correlation between them (Colonna et al., 2005; Golob & Recker 2001, p. 12; SPSS, 2008). For further in-depth analysis of the relations between variables it is recommended that analyses be performed at the level of quarters of a year or even months (e.g. time series analysis).

Variables' values (Object scores) were within the observed two-dimensional area in all performed analyses. The covariance matrix at each year during the period from 2006 to 2008 is not positive definite and therefore we did not gain the solutions in the SPSS 17.0. With the identification of the influential process KPIs which makes an important contribution to the business results of the company, we achieved the third and fourth research objective of the research (Table 3).

In addition to the calculated parameters, it should be taken into account when interpreting the results of land terminals that they are not linked to investment, financial income and outcome and tax liabilities. In 2008 a significant portion of the higher costs was on the one hand due to the signing of the new collective agreement, and on the other due to the introduction of the concession fee for the state. Beside that there is also the depreciation, which all together certainly affected return on sales (ROS) at the level of the Luka Koper Group (Luka Koper 2009).

#### 4.6 Employability of findings

Results of the research with the theoretical concept and defined empirical publicly available data, shows the employability of the model. The model for identification of the key performance indicators is in this manner confirmed through the research to be useful at various levels of management of the company:

- At the level of all business processes, the business model is suitable for the identification of performance indicators, classification and assessment of the cause and effect relations between performance indicators.
- The next level is the identification of performance indicators and assessment of the relations between business indicators in the framework of EFQM excellence model or its criteria and sub-criteria.
- The highest level is the use of the model for the identification, classification and assessment of the relations between business indicators in the four perspectives of business or Balanced Scorecard (BSC).
- Whatever the level of the model usage, simulation is always possible by combining the performance indicators and obtaining new knowledge about



their relations and improving the monitoring of the strategic guidelines and goals.

The developed model could represent support for analysis and composition of the 'processes map' as well as the strategy map of the company and, consequently, improvements of the business processes in the short and long-term.

## 5 Conclusions and further research

With the increasing complexity of the business environment, companies focus more and more on managing the processes and employees who are involved with them. As we can see from the literature review, case studies, research experiences and from model development, if the companies wish to remain competitive in this globally strengthening world, and to improve their management system, they must increase awareness and exploitation of their key business processes. For that reason a holistic approach, like implementation of the EFQM model, is the challenge to support development of the Integrated Management System in order to encourage nourishment of adopted values, innovation, productivity and preservation of the environment and the commitment to excellence.

While fostering exploitation of the resources and processes, companies frequently integrate standards and models (e.g. ISO 9001, ISO 14001, ISO 22000, EFQM, BSC, etc.) into their management system. Qualitative and quantitative analysis of many researches into excellence model implementation indicates the general favorable influence of the KPIs' influence on the KPRs (Hausner & Vogel, 1999; Hendricks & Singhal, 2000; PWHC, 2000; Eriksson & Hansson, 2003; Mann & Saunders, 2005; Mann & Grigg, 2006; Miyagawa & Yoshida, 2005; Boulter et al., 2005).

The case of a company which is regularly and systematically accomplishing the Supervisory Board resolution about business management system (model) harmonization with principles of the EFQM model is very rare in Slovenia. From the literature review we have not found any similar case study research. At this point is worth mentioning that the management system harmonization with the EFQM model implementation has been definitely encouraged by the use of regularly performed self-assessments since 1999. Results of the performed self-assessments and EEA competition assessments are used for projects improvements, preventive

and correction measures and innovation and learning on the all key business activities. Self-assessments are being deployed also on the dependent companies of the Luka Koper Group.

Regarding to the ascertainments of the factor analysis above, we identified 17 latent factors which could be labeled and represented in Table 2. Labeled factors represent the confirmation of the business model harmonization with EFQM model principles. Analysis of documents and records and the process KPIs' values from the EEA and annual reports indicates their significant influence on the KPRs. On the basis of comparative method findings we achieved the first and second research objective (Table 1). With the identification of the influential process KPIs (Table 3 and table 4), which makes an important contribution to the KPR of the company, we also achieved the third and fourth research objective. In this paper only a part of our findings are represented because the research is still being performed. From the analyses of the previous research we could ascertain that the EFQM model implementation is fostering company's organizational culture, based on their adopted values.

This quantitative oriented case study has some limitations, too. First of all, the findings cannot be generalized because they are limited to only one case study (Yin, 1994). The second limitation is the fact that, in the context of this paper, we used only publicly available data, because we cannot make use of the data which represent the company's competitive advantages. Another limitation is the fact that this research is being performed only for a Slovenian port and logistic system. Comparison (benchmarking) and assessment between different case studies, on the international level, should be an issue for further research. On that basis we are further studying the importance of the diagnostics and evaluation of the management system. The diagnostic activities are usually 'too expensive' for the company and its usually overworked employees. Because of the latter's outlook, diagnostics is regarded as being a time-consuming activity. With the development of a model for identification of the influential process KPIs which makes an important contribution to the KPRs, the company can perform its own diagnostic activities and focus on improvements of the key processes, and consequently on the results in a short and long-time period.

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## Appendix A

KPI (variable)	OR1	EBITDAm1	AV 1	OE 1	ROS1	RU1	TT2	MT2	LT2	OC3	VOC3	TCU3	NC3	FC3	EC3	WACN 3	NIm4
OR1	1	-0.4114	-	-	-	0.0353	0.4010	-	-	0.3640	0.3857	0.1829	-	0.1833	0.1620	0.5855	0.612
EBITDAm1		1	0.4340	0.3705	0.1486	0.1883	-	-	0.5223	-	-	-	0.2781	-	-	-	-
AV1			1	0.4195	0.2214	0.4603	-	-	0.6873	-	-	0.2909	-	-	-	-	-
OE1				1	0.1685	0.3308	-	-	0.5328	-	-	0.1879	-	-	-	-	-
ROS1					1	0.2203	-	-	0.2898	-	-	0.1606	-	-	-	-	-
RU1						1	-	-	0.6248	0.0141	-	0.4922	-	-	-	0.1277	0.086
TT2							1	0.3938	-	0.4107	0.4902	-	-	0.5333	0.4111	0.5941	0.651
MT2								1	-	0.0092	0.1083	-	0.2302	0.5888	0.4126	-	-
LT2									1	-	-	0.4190	-	-	-	-	-
OC3										1	0.3782	0.1608	-	0.2800	0.1703	0.5657	0.593
VOC3											1	0.0981	-	0.2884	0.2368	0.5884	0.624
TCU3												1	-	-	-	0.3458	0.322
NC3													1	0.1530	0.1017	-	-
FC3														1	0.4200	0.2194	0.272
EC3															1	0.2060	0.959
WACN3																1	0.959
NIm4																	1

Table 5. "Correlation Matrix 2006 (Ordinal), Note: Abbreviations for variables are explained in Table 3".

## Appendix B

KPI (variable)	OR1	EBITDAm1	AV 1	OE 1	ROS1	RU1	TT2	MT2	LT2	OC3	VOC3	TCU3	NC3	FC3	EC3	WACN 3	NIm4 dim1	NIm4 dim2
OR1	1	-0.0758	-0.1195	-0.1756	-0.0029	0.0272	-0.1035	0.1083	-0.1458	0.2197	0.2076	0.0971	0.3811	0.1942	0.0090	0.1147	-0.3187	0.2867
EBITDAm1		1	-0.0604	0.0464	0.0071	-0.0942	0.0724	-0.0078	0.0523	-0.0648	-0.0376	-0.0912	-0.1618	0.0378	0.0271	-0.0623	0.2029	-0.0058
AV1			1	0.2573	-0.0503	0.7102	-0.2360	-0.3386	0.0955	-0.2642	-0.4530	0.4220	-0.03284	0.7708	-0.2672	0.1077	-0.5557	-1.0
OE1				1	-0.0065	0.1025	0.0369	-0.1399	0.1260	-0.2106	-0.2342	0.0001	-0.2918	-0.3280	-0.0530	-0.0675	0.1431	-0.3923
ROS1					1	-0.0424	0.0186	0.0144	0.0045	0.0048	0.01623	-0.0291	-0.0163	0.0516	0.0159	-0.0117	0.0474	0.0455
RU1						1	-0.2526	-0.2085	-0.0103	-0.0816	-0.2414	0.399	0.2019	-0.7338	-0.3004	0.1557	-0.6397	-0.6544
TT2							1	0.0365	0.0695	-0.0651	0.0054	-0.2062	-0.2530	0.2122	0.0817	-0.1149	0.4035	0.1384
MT2								1	-0.0799	0.1573	0.2111	-0.0958	0.1424	0.3905	0.0851	0.0068	0.0599	0.4135
LT2									1	-0.1569	-0.1507	0.0628	-0.2670	-0.1487	-0.0095	-0.0789	0.2161	-0.2130
OC3										1	0.2717	0.0306	0.3771	0.3499	0.0494	0.0956	-0.2265	0.4357
VOC3											1	-0.0793	0.3138	0.5434	0.1060	0.0510	-0.0466	0.6057
TCU3												1	0.2793	-0.4089	-0.1352	0.1466	-0.5438	0.3211
NC3													1	0.1621	-0.0382	0.2483	-0.7432	0.3502
FC3														1	0.2825	-0.0742	0.4744	1.00
EC3															1	-0.0457	0.2019	0.2623
WACN3																1	-0.3205	-0.0066
NIm4																	1	0.2631

Table 6. "Correlation Matrix 2007 (Ordinal &amp; Multiple Nominal), Note: Abbreviations for variables are explained in Table 3".

KPI (variable)	OR1	EBITDAm1	AV 1	OE 1	ROS1	RU1	TT2	MT2	LT2	OC3	VOC3	TCU3	NC3	FC3	EC3	WACN 3	NIm4 dim1	NIm4 Dim2
OR1	1	0.0284	0.0589	0.0433	0.0177	0.0676	- 0.0239	- 0.0529	0.1858	0.4582	0.5102	0.3002	0.3004	- 0.0551	0.1151	0.0379	- 0.4673	- 0.4063
EBITDAm1		1	0.1931	0.1957	0.1748	0.0749	0.0455	0.0501	0.1129	- 0.0674	- 0.0362	0.0489	- 0.0604	- 0.3159	- 0.0114	- 0.0569	0.1936	- 0.2988
AV1			1	0.3731	0.3330	0.1434	0.0863	0.0948	0.2170	- 0.1230	- 0.0630	0.0965	0.0852	- 0.6021	- 0.0203	- 0.1079	0.3632	- 0.5736
OE1				1	0.3386	0.1434	0.0889	0.0988	0.2136	- 0.1439	- 0.0849	0.0862	- 0.0990	- 0.6114	- 0.0254	- 0.1115	0.3891	- 0.5681
ROS1					1	0.1257	0.0813	0.0917	0.1829	- 0.1531	- 0.0375	0.0622	- 0.1046	- 0.5478	- 0.0287	- 0.1024	0.3070	- 0.4908
RU1						1	0.0294	0.0294	0.1011	0.0049	0.0329	0.0690	0.0015	- 0.2298	0.0052	- 0.0359	0.0834	- 0.2580
TT2							1	0.0286	0.0367	- 0.0734	- 0.0633	- 0.0040	- 0.0492	- 0.1449	- 0.0158	- 0.0304	0.1341	- 0.1050
MT2								1	0.0304	- 0.1120	- 0.1037	- 0.0231	- 0.0748	- 0.1619	- 0.0251	- 0.0371	0.1819	- 0.0947
LT2									1	0.1060	0.1571	0.1632	0.0670	- 0.3393	0.0322	- 0.0480	0.0178	- 0.4553
OC3										1	0.6354	0.3041	0.3992	0.2497	0.1465	0.1012	- 0.7417	- 0.1800
VOC3											1	0.3496	0.4183	0.1561	0.1556	0.0894	- 0.7376	- 0.3062
TCU3												1	0.1986	- 0.1287	0.0780	0.0105	- 0.2746	- 0.3716
NC3													1	0.1713	0.0965	0.0678	- 0.4917	- 0.1113
FC3														1	0.0452	0.1820	- 0.6472	0.9055
EC3															1	0.0221	- 0.1737	- 0.0604
WACN3																1	- 0.1780	0.1251
NIm4																	1	- 0.1572

Table 7. "Correlation Matrix 2007 (Numerical &amp; Multiple Nominal), Note: Abbreviations for variables are explained in Table 3".

## Appendix C

KPI (variable)	OR1	EBITDAm1	AV 1	OE 1	ROS1	RU1	TT2	MT2	LT2	OC3	VOC3	TCU3	NC3	FC3	EC3	WACN 3	NIm4
OR1	1	0.3161	0.4090	0.2163	0.3626	0.1838	0.5838	0.3639	- 0.3280	0.1078	- 0.0977	- 0.1392	- 0.0446	0.4992	0.2697	0.0618	0.2576
EBITDAm1		1	0.7108	0.4725	0.2906	- 0.3275	0.6254	0.8096	- 0.0356	0.1702	-0.110	- 0.1934	- 0.3559	0.1618	0.5204	-0.1480	0.8385
AV1			1	0.4645	0.3853	- 0.3366	0.7438	0.7929	- 0.1702	0.1802	- 0.1286	- 0.2121	- 0.2985	0.3434	0.5252	-0.0892	0.7694
OE1				1	0.2000	- 0.2138	0.4203	0.5238	- 0.0392	0.1117	- 0.0736	- 0.1278	- 0.2243	0.1267	0.3385	-0.0890	0.5363
ROS1					1	- 0.1724	0.5650	0.3359	- 0.3297	0.1022	0.0017	- 0.1330	- 0.0312	0.4976	0.2520	0.0682	0.2275
RU1						1	- 0.3365	- 0.3650	0.0722	- 0.0824	0.0582	0.0966	0.1397	- 0.1497	- 0.2411	0.0436	-0.3567
TT2							1	0.7110	- 0.4480	0.1912	- 0.1610	- 0.2397	- 0.1585	0.7117	0.5049	0.0415	0.5771
MT2								1	- 0.0580	0.1904	- 0.1246	- 0.2174	- 0.3874	0.2047	0.5787	-0.1562	0.9219
LT2									1	- 0.0538	0.0722	- 0.0835	- 0.1281	- 0.5796	- 0.0850	-0.1603	0.0988
OC3										1	- 0.0329	- 0.0531	- 0.0669	0.1002	0.1276	-0.0161	0.1798
VOC3											1	0.0410	0.0301	- 0.1162	- 0.0878	-0.0047	-0.1035
TCU3												1	0.0683	- 0.1445	- 0.1482	0.0093	-0.1969
NC3													1	0.1210	- 0.2323	0.1305	-0.4567
FC3														1	0.1971	0.1973	-0.0061
EC3															1	-0.0812	0.5765
WACN3																1	-0.2257
NIm4																	1

Table 8. "Correlation Matrix 2008 (Ordinal), Note: Abbreviations for variables are explained in Table 3".

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