



KNOWLEDGE FOR THE RIGHT STRATEGY: LEADING ROLE IN THE CLUSTER OF SUPPLY COMPANIES

Aleksander Janeš

University of Primorska, Faculty of Management Koper
aleksander.janes@fm-kp.si

Abstract:

In our paper we present the case study of the Ydria Motors d.o.o. company which produces semi products for household appliances. The company is a part of ebmpapst international Group and focuses on new products due to environmental standards and logistic services. In the Slovenian regional area the company is important member and cofounder of supply cluster. Now cluster consists of 27 companies from different parts of Slovenia, which are divided into three groups: material suppliers, service providers and suppliers of tools and equipment. Most of the cluster members are smaller companies. Much attention is devoted to education and mutual knowledge. Knowledge and development will provide needed supplier base cluster, which together with Ydria Motors Company will become an important factor in the supply chain, especially for the companies of household appliances in the EU and beyond. Within our survey we stressed the influence of implemented management standards on the products, people and society.

Keywords: knowledge, strategy, supply, causal relations, performance indicators.

1. INTRODUCTION

Company Ydria Motors d. o. o. (YM) produces small electrical motors and fans and is one of the leading players in the industry of motors for home appliances in Europe and in the world in terms of quality, quantity and flexibility. The company was first located in the vicinity of the 500 years old town Idrija known as one of the largest mercury mine in the world and famous for the Idrija lace. It developed from the former plant of Iskra from Železniki, which later became Iskra Rotomatika, then Rotomatika, part of which finally became Ydria Motors. Due to problems with space, the company decided in 2002 to find a more suitable location and moved to Podskrajnik, the Municipality of Cerknica.

The company is wholly owned by the company ebmapst from Landshut, Germany with a wide spread sales network all over the world. YM exports as much as 95 % of its production and only 5 % is sold on the Slovenian market. In 2006 it established a new international logistics centre which is in charge of accepting materials and dispatching equipment from the parent company in Landshut and Mulfingen and distributing products directly to end buyers. It is also a system supplier of electrical motors and fans for key large customers – producers of top-class home appliances e.g. AEG, Electrolux, Bosch-Siemens and Miele.

The company manufactures more than one thousand different end products, differing in terms of appearance and integration options (drying and washing machines, refrigerators, fan and microwave ovens, independent fans).

The company follows the principle of contributing to the social responsibility with care for people, society and environment in which it operates. Therefore, sponsorships and donations are an essential part of YM operations. Above all, company support activities that are in any way connected with employees and investments in the area where the employees come from. YM also support sustainable impacts on the environment and the society and the activities based on voluntary work. Thus the company fulfils part of its social responsibility, its values and care for the future (YM, 2011). The company, according to its development, is facing questions about its future organic growth. Thus, the company faced the challenge of setting PIs', which are the central theme of our research.

Analysis of researches, documents and records and processes KPI's values indicates the latter's significant influence on the company's strategy fulfilment. Analysis of many qualitative and quantitative researches about KPI implementation performed all over the world indicates the general favourable influence of KPI's on the organizations strategy fulfilment (Modell, 2009; Kaplan & Norton, 2000; Poister, 1982; Wisniewski & Dickson, 2001; Kaplan & Norton, 2004; Ittner et al., 2003). Namely, a recent trend in companies' performance valuation is the increasing emphasis on the intangible measures and non-financial perspectives (Wang, 2005).

2. RESEARCHES AND LITERATURE REVIEW

The Balanced Scorecard (BSC) or key performance indicators (KPI) origins date back to the time when the management of organizations have generally relied on short-term perspective and have took into account historical data, which represented mainly financial performance indicators (Johnson & Kaplan, 1987; Modell, 2009).

Gradually, the need arises to take into account perspectives such as customer satisfaction, the internal process perspective and the perspective of learning and growth. In nineties of the last century, the consideration of various perspectives of business operations and associated financial and non-financial performance indicators has become an important topic of practitioners, experts and researchers.

On the basis of cause - effect relations between these four perspectives can be accomplished long-term strategic goals of the organization. This can be achieved by the decomposition of vision and strategic objectives of the organization on a set of causally related performance indicators (PI), which represent financial perspective, customers and internal processes and learning and growth perspective. Suchlike set of indicators should be cascaded across all levels of management so as to promote understanding of the objectives of the organization from the perspective of managers and all employees (Kaplan & Norton, 2000; Modell, 2009; Poister, 1982; Wisniewski & Dickson, 2001).

As a rule, PI's are determined from past experience, and by regular reviewing. Where appropriate, expanded range of PI is confirmed, and some of them are also being phased out. It is necessary to clarify why we measure, what and how often we measure, before we decide how to measure (Jones, 2009). Managers should be first asked questions about what they want to achieve, what their objectives are and how they describe them. Therefore, we begin to set up the system of performance indicators by consensus of managers regarding the description of their goals in four perspectives. This will facilitate the determination of measurement as well as changing the PI themselves and the sources of data (Kaplan & Norton, 2004; Ittner et al., 2003; Poister, 1982). Historically, the processes in the organizations were investigated mainly qualitative, verbal and linguistic. Previous research in the field of business processes have been predominantly performed with the data within a short time period.

Meanwhile, the longitudinal and dynamic researches for developing theories in this area are very rare. An example for updating the research methodology could be the theoretical physicists (e.g. Einstein or Hawkings), who think in the context of mathematical equations. Thus, the mathematical tools are appropriate to increase the exactness of the conceptual and empirical research. Completion of qualitative research of business processes with statistical tools hold great potential in this area. Namely inclusion of the process approach and methodology of longitudinal treatment of business processes makes very important addition to the conceptual thinking of researchers (Brock & Durlauf, 2001; Fritz & Fritz, 1985; Monge, 1990).

Given the framework of the strategy map, which consists of four perspectives, and within them a large number of related strategic objectives, it is considered that business processes added value is increased by indirect and mixed in mutual relations. Added value in business processes is manifested in the form of chains of cause - effect relations from nonfinancial and quantifiable PI in the learning and growth perspective, all to the results in customers' perspective (Ittner & Larcker, 1998) and financial perspective. Balanced Scorecard provides a comprehensive framework that translates the strategic goals of the organization into a coherent set of measures. The biggest advantage of the Balanced Scorecard, as compared to other approaches or models, is its ability to integrate the capabilities of the various aspects of the company - financial and non-financial as well as internal and external (Kaplan & Norton, 2006).

Since we do not know exact lawfulness between the observed variables, or PI, which were taken into account, in addition to the available literature, researches and documents and records we especially took into consideration information's contained in the time series of observed variables (i.e. PIs').

Already through the observation of linear regression between pairs of variables or PI we can presume causality, which is then confirmed by Granger causality test (Smith, 1993). It should be noted that from the literature review so far we did not found any similar case study. Knowledge about the correlations and causality between the KPI in the selection and composition of balanced scorecard is essential for efficient and effective management of the organizations (Janeš & Dolinšek, 2010). Studies of many authors in the field of Balanced Scorecard show the actuality of this scientific field and the selected methodology provides support to organizations decision-making process in real time.

3. METHODOLOGY

Purpose of our research is to explore and clarify the cause - effect relations between PI. This will give us a basis for understanding these relations and understanding about the relations between business strategy and operations at all levels. In this quantitative oriented research the influence of the measured process PIs' on the company's strategy fulfilment is discussed. As a research method was chosen case study (Yin, 1994) of the YM Company which is based on the following criteria:

- Environmental management system ISO 14001 certificate is received in 2000,
- Quality management system ISO 9001 certificate is received in 2003, and
- Family-friendly company certificate is received in 2010.

Documents and records were and still are studied closely and included analysis of public available data from company's documents and records and web sites. Observations were performed during research which is still being continued in its preliminary phase. Data for the model testing, application and analyses were gathered in August and September 2010.

The main research question is: Which performance indicators should be measured to fully fulfil the strategy and what are their causal relations? Preliminary results are indicating the benefits and opportunities for improvements on the field.

4. EMPIRICAL FINDINGS AND DISCUSSION

Due to limited space, we present only some of the findings of calculating a linear relationship to the selected PIs'. To calculate the model parameters were collected PIs' of the company. All variables represent PIs' that are monitored by the company annual reports which are submitted to the company owner, ebmpapst international Group from Landshut in Germany. The PI used are: production volume of the three selected products, sales quantities of the three selected products, total production, total sales, number of production workers and the number of supervisory workers. Performance indicators used were ten in total (see Table 1).

We analyzed linear relationship between pairs of PIs' during the period from January 2004 to July 2010. The analysis was carried out in the manner that:

- The relations between the indicators are linear,
- We considered scatter diagrams and,
- Linear regression was calculated between pairs of selected PIs'.

In general, the degree of linear relationship and the variance between the performance indicators is medium to high (e.g. from $EM25S = 0.8886 \times EM25 + 139087$ and $R^2 = 0.3141$ to $EM21S = 1.0136 \times EM21 + 1677.3$ and $R^2 = 0.9527$), as a result of numerous factors.

One of the most important is the quality and consistency of the data used since the time series are based on monthly data. In addition, production has been subject to instability, such as the impact of the global crisis in the period from 2007 to 2009, from which the company bear the consequences even today. All these factors affect the quality of the identified linear relationship between PI. For this purpose, we continued analysis of the empirical testing of the causal relations between PI.

4.1. Stationarity test

We first performed a stationarity test (see Table 1). Stationarity means that the time series has its mean and variance constant during the observation period and the value of covariance between two time periods depends only on the lag between the two periods (Gujarati, 1995). Stationarity was tested to confirm that there is no spurious regression between the PI.

Table 1: Stationarity test

PI	T1	T2	T3
EM21	0.223554	-3.499143	-2.504887*
EM25	1.062103	-2.387780*	-0.702753*
EM30	-1.423983*	-1.987317*	-2.313793*
EM21S	0.342541	-3.100907*	-1.696859*
EM25S	0.766911	-2.768304*	-2.751491*
EM30S	0.561337	-2.356120*	-1.251995*
TOTALPP	0.736998	-1.905930*	-1.426430*
TOTALSP	0.810399	-1.650425*	-1.595853*
PRODW	0.418330	-2.019898*	-1.548013*
SUPRVW	1.078856	-1.701756*	-2.274803*

Note: values marked with an asterisk * means stationary time series; T1 stationarity test - None, T2 stationarity test - Trend and Intercept; T3 stationarity test - Intercept. Selected critical value of t statistics is at 10% level. EM21, EM25 and EM30 are numbers of produced pieces; EM21S, EM25S and EM30S are numbers of sold pieces; TOTALPP is total number of produces pieces; TOTSLSP in total number of sold pieces; PRODW is number of production workers; SUPRVW is number of supervisory workers.

Based on the stationarity test (see Table 1) we formed twelve causal relations. These relations were defined on the basis of the relations between business processes: e.g. (1) Production of product EM21 may be related to quantity of sales of this product EM21S, (4) Production of product EM21 may be related to the total products quantity produced TOTALPP, (6) the quantity of product EM21S sold may be related to the total quantity of products TOTALSP sold, (9) the number of production workers PRODW may be related with the total quantity of produced products TOTALPP, etc (for more see Table 2).

4.2. Causality between PI

The concept, which is interesting for our case study, is the time scale causality, which means that the cause occurs before the result and contains unique information about the latter. From this idea follows that knowing the cause supports predictions of several aspects of the consequences. In this example we set variable X as a cause of variable Y if we get better

predictions about Y, using historical information about X, than without this information (Yin, 1994; Granger, 1986).

Selected relations were tested with Granger causality test in the statistical software Eviews 7.1. Each test was performed by taking into account the different periods between successive values of PIs'. Thus, we considered the period from 1 month in the first test to one additional month for the next test, all the way to 24th months in the last test (i.e. 1 month, 2 months, 3 months, etc., up to 24 or 25 months). In Table 2 are the causality test results for the period between the selected indicators, which include 1, 2, 4, 6, 10, 11 and 12 months. Our results show that between the production of EM30 and sale of EM30S there is a statistically significant causal relationship where EM30 is the cause and EM30S the effect. Under certain conditions, as a statistically significant are causal relations between the rest of the PIs': e.g. TOTALPP and EM21, EM25 and TOTALPP, TOTALSP and EM25S, etc. Very interesting is also a causal relation between the number of production workers PRODW and the total quantity of manufactured products TOTALPP, and the total quantity of products sold TOTALSP and the number of supervisory workers SUPRVW. Other examples of where it was possible to identify statistically significant causal consequent relations can be seen in Table 2.

In the case of production of EM21 and EM25 products, it was not possible to identify causality with their respective quantities sold EM25S and EM21S. This fact can be seen as recognition by the Granger test that it is the same entity, i.e. produced quantity of product EM21 and quantity of sold product EM21S and in the same manner EM25 and EM25S. Which opens up further research sub-questions in the context of causality and what relations we should add into the consideration in the further analysis? Based on preliminary results we will further develop our case study research methodology with its qualitative dimension.

Table 2: Causal relations between PI

	Causality / lags	1	2	4	6	10	11	12
1	EM21S→ EM21	0.7847	0.8635	0.8237	0.6640	0.7281	0.6404	0.6343
1	EM21→ EM21S	0.1366	0.4978	0.4069	0.1934	0.5990	0.5740	0.6596
2	EM25S→ EM25	0.8764	0.4744	0.5094	0.8323	0.2889	0.2665	0.2102
2	EM25→ EM25S	0.1823	0.3729	0.3982	0.4621	0.7219	0.6143	0.8404
3	EM30S→ EM30	0.6385	0.7059	0.4329	0.6018	0.6345	0.1622	0.0931
3	EM30→ EM30S	0.5029	0.5727	0.3215	0.3971	0.0247*	0.0243*	0.0021*
4	TOTALPP→ EM21	0.5537	0.0967*	0.1482	0.5114	0.6442	0.4692	0.2689
4	EM21→ TOTALPP	0.9849	0.7746	0.9641	0.7109	0.7999	0.4441	0.3021
5	TOTALPP→ EM25	0.0173*	0.2028	0.5809	0.1751	0.1579	0.2034	0.0099*
5	EM25→ TOTALPP	0.4394	0.4020	0.5806	0.5152	0.6464	0.7866	0.6707
6	TOTALSP→ EM21S	0.7107	0.0456*	0.1594	0.2737	0.2519	0.2156	0.1428
6	EM21S→ TOTALSP	0.4949	0.6679	0.8037	0.8399	0.8219	0.6301	0.4070
7	TOTALSP→ EM25S	0.0002*	0.0046*	0.0112*	0.0133*	0.0071*	0.0055*	0.1223
7	EM25S→ TOTALSP	0.0029*	0.0235*	0.3211	0.1124	0.0823*	0.0685*	0.2924
8	TOTALSP→ TOTALPP	0.5284	0.2765	0.2664	0.7528	0.2953	0.0666*	0.2908
8	TOTALPP→ TOTALSP	0.8138	0.2709	0.0276*	0.1056	0.0605*	0.0153*	0.4670
9	TOTALPP→ PRODW	0.2030	0.1904	0.1334	0.1344	0.0239*	0.0438*	0.0404*
9	PRODW→ TOTALPP	2.E-06*	8.E-07*	7.E-05*	3.E-05*	0.0012*	0.0077*	0.0607*
10	TOTALSP→ PRODW	0.2739	0.2689	0.1925	0.1927	0.0582*	0.0322*	0.0589*
10	PRODW→ TOTALSP	2.E-07*	3.E-06*	8.E-05*	5.E-05*	0.0020*	0.0056*	0.0733*
11	TOTALPP→ SUPRVW	0.2533	0.2529	0.1568	0.1011	0.1162	0.0634*	0.0180*
11	SUPRVW→ TOTALPP	0.0023*	0.0418*	0.4030	0.6281	0.2116	0.3334	0.2674

	Causality / lags	1	2	4	6	10	11	12
12	TOTALSP→ SUPRVW	0.3461	0.1151	0.1909	0.1053	0.0878*	0.0627*	0.0164*
12	SUPRVW→ TOTALSP	0.0002*	0.0189*	0.3836	0.5569	0.5843	0.7191	0.2662

Note: Values marked with an asterisk * means a causal relation between PI provided by the Granger test. The necessary conditions for causality, is that the cause happens before the effect and contains unique information about the latter (Granger, 1986).

5. CONCLUSIONS

From this preliminary test of causation, we come to important conclusions. The first is that the PIs' are systematically monitored and that the resulting data are consistent and suitable for further study. The second observation relates to the period from 2004 to 2010 which covers the information about causality contained in the time series in the long term and is crucial for determination of causality (Smith, 1993). In addition, in the data is somewhat captured the impact of global crisis on the company. The third finding relates to the fact that the company has opportunities for improvement in the field of relations between the PIs'. This *consequently enables support to the company's management in taking a leading role in cluster of supply companies*. Interesting is also a fact that the company has not faced a sharp decline in customer orders in the years from 2007 to 2011, as an effect of the global financial crisis which is reflected through the lower performance of many Slovenian companies. Could this be an effect of the systematic process approach (see section 3) and performance monitoring? Further research into the impact of introducing the four perspectives of the BSC to monitor the implementation of strategies, organizational culture and business results is definitely recommended and the top management of the YM Company is very interested about it.

As mentioned above in literature review, the biggest advantage of the Balanced Scorecard is in its ability to integrate the capabilities of the various perspectives of the company i.e. financial and non-financial as well as internal and external perspectives. A recent trend in companies' performance measurement is the increasing emphasis on the intangible, qualitative and non-financial perspectives (Wang, 2005). As we can conclude from analysis of many qualitative and quantitative researches about KPIs implementation performed all over the world, which indicates the general favourable influence of KPI's on the strategy fulfilment of organizations (Modell, 2009; Kaplan & Norton, 2000; Poister, 1982; Wisniewski & Dickson, 2001; Kaplan & Norton, 2004; Ittner et al., 2003). A case study of the Ydria Motors d.o.o. has also some limitations. The first is that the present organization is just one. A second limitation relates to sample size period and quality of the data which is and would be available. A third limitation is a quantitative analysis in the four perspectives of the balanced scorecard (Kaplan & Norton, 2006), methodology and selected statistical software Eviews 7.1.

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