

IMPORTANCE OF DIFFERENT PERSPECTIVES IN INTEGRATED PERFORMANCE MEASUREMENT SYSTEMS

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Abstract

Purpose – Performance management literature advocates the usage of integrated performance measurement systems (IPMS), which incorporate financial as well as non-financial measures of performance. One of the best known IPMS, the Balanced Scorecard (BSC), categorises performance measures into four basic perspectives: financial, customer, internal business processes, and learning and growth perspective. The aim of this paper is to find out whether the measures used by Slovenian companies can also be grouped according to these four perspectives and if yes – is there a significant difference in average overall importance of different perspectives between companies that use IPMS and companies that do not use such systems. Also, we would like to find out if performance perspectives are weighted equally by companies using IPMS or is there any weighting bias.

Design/methodology/approach – Data for the study were collected from 249 companies during the survey “Cost management and contemporary management tools in Slovenian companies”. Importance of different performance indicators was measured using a five-point Likert scale and respondents were asked to evaluate the importance of 70 financial and non-financial measures. We tested our research hypotheses using several statistical techniques, such as principal component analysis and discriminant analysis.

Findings – Overall, the results confirm that non-financial measures can be grouped according to proposed non-financial perspectives (according to the BSC). Also, the average overall importance of different perspectives differs between companies that use IPMS and companies that do not use such systems, even though this difference is statistically significant only for financial and learning and growth perspective. Furthermore, the results indicate that different perspectives are not weighted equally and weighting bias appears to be greater for companies using IPMS than for companies not using such systems.

Research limitations/implications – The generalisation of research results is limited because only Slovenian companies were included in the survey. This study begins to reveal possible reasons that could influence the effectiveness of IPMS. Further research should focus on studying the relationship between IPMS's effectiveness and overall importance of different performance perspectives. In order to get a better understanding of this issue, case study approach should also be used in the future.

Keywords: performance measures, Integrated Performance Measurement Systems, performance perspectives, Balanced Scorecard.

1. INTRODUCTION

Over the last two decades there has been a growing criticism of traditional performance measurement systems as too narrowly focused on short-term-oriented financial performance measures. Critics claim, that traditional financial performance measures do not provide comprehensive information on changes in areas of strategic importance as they only show the effects of past decisions. That is why they advocate the usage of integrated performance measurement systems (IPMS), which incorporate financial and non-financial performance measures. If used in harmony, these measures are supposed to provide a better understanding of business as a whole.

One of the most widely used IPMS is the Balanced Scorecard (BSC), developed by Kaplan and Norton in 1992. The model was developed to steer businesses beyond traditional and reactive financial measures

(Ahn, 2001). According to Kaplan and Norton (1992, 1996, 2001, 2008) the Balanced Scorecard complements financial measures of past performance with measures of the drivers of future performance. The methodology of the Scorecard is that it breaks down the organisation vision and mission into strategic objectives that can be categorised into four basic performance perspectives: (1) financial, (2) customer, (3) internal business processes and (4) learning and growth perspective. In viewing a company from four vital perspectives, the BSC is intended to link short-term operational control to the long-term vision and strategy of the business. It permits a balance between desired outcomes and the performance drivers of those outcomes as well as between objective and more subjective measures.

The paper aims to investigate whether the measures used by Slovenian companies can also be grouped according to four BSC's performance perspectives and if yes – is there a significant difference in average overall importance of different perspectives between companies that use IPMS and companies that do not use such systems. Also, we would like to find out if performance perspectives are weighted equally by companies using IPMS or is there any weighting bias. To accomplish the purpose of the paper, we will test the following research hypotheses: (1) Companies using IPMS put more emphasis on non-financial measures as opposed to companies that do not use such systems. (2) Based on overall importance of different performance perspectives we are able to distinguish between companies using IPMS and companies that do not use such systems. (3) Companies using IPMS put equal emphasis on different performance perspectives.

Data for the study were collected from 249 companies during the survey "Cost management and contemporary management tools in Slovenian companies". The sample consists of large, medium and small companies from different industrial sectors, including manufacturing and service. Importance of different performance indicators was measured using a five-point Likert scale and respondents were asked to evaluate the importance of 70 financial and non-financial measures. We test our research hypotheses using multivariate data analysis techniques, such as principal component analysis and discriminant analysis.

The paper is organised as follows. In the following section we first present our research hypotheses and their theoretical underpinnings. Next, we describe research methodology. In section IV we discuss the results and their implications, whereas in section V we provide our final conclusions.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

There is no doubt that performance measures are an essential element in the evaluation of a company's success in achieving its strategic objectives (Crabtree & DeBusk, 2008). However, prior to the start of the information age in the late 20th century, financial measures have been used as the sole criterion for managing organisations. Since then, management accounting researches have been describing many limitations of using only financial measures for evaluating and managing performance. The main disadvantage of financial measures is that they show the effects of decisions already taken. As such, financial measures are inadequate for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation (Kaplan & Norton, 1996). According to Bourne and Neely (2003), traditional accounting-based performance measures have been characterised as being internally focused, backward looking and too highly aggregated. Rapid changes in technology, the growing importance of service industries and increased global competition have further undermined the role of financial measures, and consequently the need for alternative performance measurement systems arose. As a result, various performance measurement frameworks with multidimensional performance views have been proposed. Examples include Balanced Scorecard (Kaplan & Norton, 1992, 1996, 2001, 2008), Performance Pyramid (McNair, Lynch & Cross, 1990; Lynch & Cross, 1991), Tableau de Bord (Epstein & Manzoni, 1998) and performance management framework (Otley, 1999). Even though these approaches vary, they all aim at improving decision making and problem solving by helping managers understand the interrelationships and trade-offs between different performance perspectives (Banker, Chang, Janakiraman & Konstans, 2004) with the ultimate aim of improving performance.

According to the theory (Bourne, Neely, Mills & Platts, 2003; Chenhall & Langfield-Smith, 2007; Ittner, Larcker & Meyer, 2003; Moers, 2005), companies that use IPMS put more emphasis on non-financial measures as opposed to companies that do not use such systems. Our first research hypothesis regarding the usage of integrated performance measurement systems is therefore the following:

H1: Companies using IPMS put more emphasis on non-financial measures as opposed to companies that do not use such systems.

As follows, we discuss the Balanced Scorecard (BSC) in more detail because it has received the most attention in the relevant literature. Balanced Scorecard was introduced by Kaplan and Norton in 1992 as a performance management tool that reflects all the measures critical for the success of the firm's strategy (Blocher, Chen, Cokins & Lin, 2005). According to Kaplan and Norton (1996) the Balanced Scorecard complements financial measures of past performance with measures of future performance drivers. The methodology of the Scorecard is that it breaks down the organisation vision and mission into strategic objectives that can be categorised into four different perspectives: (1) financial, (2) customer, (3) internal business processes and (4) learning and growth perspective. The financial perspective defines how the company wants to be viewed by its shareholders, the customer perspective describes the value proposition that the organisation wants to apply to satisfy customers and generate more sales. Furthermore, the internal business processes perspective is concerned with key business processes that create customer value and satisfy shareholders, while learning and growth perspective relates to the changes and improvements that are necessary if a company wants to follow its strategy and make its vision come true. The four performance perspectives are identified as being critical for long-term growth and improvement, even though additional perspectives may be included in the Scorecard.

Since theoretical implications suggest that companies using Balanced Scorecard or any other IPMS follow different performance perspectives, we would also like to examine if we can distinguish between companies using IPMS (Group 1) and companies not using such systems (Group 0). Namely, we would like to know, if it is possible to predict group membership based on overall importance of different performance perspectives. Our second research hypothesis is therefore:

H2: Based on overall importance of different performance perspectives we are able to distinguish between companies using IPMS and companies that do not use such systems.

According to Paranjape, Rossiter and Pantano (2006) there are two broad streams in the literature: one acknowledges and advocates the use of BSC, while the other questions some of BSC's key assumptions and relationships. The proponents of the BSC (Bourne, Neely, Platts & Mills, 2002; Gumbus & Lyons, 2002; Kaplan & Norton, 1996; Olve, Roy & Wetter, 1999) agree that BSC is an effective performance measurement tool and advocate the usage of BSC through several success stories, such as National Insurance, Halifax, Scandia, Electrolux, British Airways, Coca-cola Beverages Sweden, British Telecom, Volvo Car Corporation. Moreover, several empirical studies confirm the association between BSC usage and improved financial performance or higher stock market returns (Braam & Nijssen, 2004; Carbtree & Debusk, 2008; Davis & Albright, 2004; Hoque & James, 2000; Ittner & Larcker, 2003; Marr, 2004). On the other hand, however, Ittner, Larcker and Randall (2003) provide evidence for a negative association between BSC usage and financial performance, while others (Bourne et al., 2002; Venkatraman & Gering, 2000) point out that along with BSC's success stories there are also many examples of unsuccessful implementations (Machine Shop, Controls, Components). Reasons for unsuccessful implementations include selection of inappropriate or excessive measures, inefficient implementation by the management, over-emphasis on financial measures or even inexistence of the causal relationship between different performance perspectives, which is one of the key assumptions of the BSC and has been challenged by several academics and practitioners (Banker et al., 2004; Kennerley & Neely, 2002; Paranjape et al., 2006; Bringall, 2002; Norreklit, 2000).

One important issue that also arises when implementing multiple performance perspectives is determining the relative weights to place on the various perspectives. Jensen (2010) argues that Kaplan and Norton did not deal with the critical issue of how to weigh the multiple perspectives represented by diverse financial and non-financial measures. Several different studies (Atkinson, Waterhouse, Wells, 1997; Banker, Chang & Pizzini, 2004; Lipe & Salterio, 2000) suggest that in practice companies do not weigh different perspectives equally, even though very little empirical evidence exists, that this somehow affects the effectiveness of BSC. However, contradicting literature exists on the weighting process of performance perspectives. Some studies stress the need to weigh different performance perspectives according to company's specific objectives (Cross & Lynch, 1989; Olson & Slater, 2002), while others argue that different performance perspectives should be equally balanced (Boulianne, 2008; Ittner, Larcker & Meyer,

2003; Moers, 2005), because weighting bias can cause that certain performance measures are overlooked and consequently informational benefits of these measures are weakened. Our last research hypothesis is thus:

H3: Companies using IPMS put equal emphasis on different performance perspectives.

3. RESEARCH METHODOLOGY

Our research setting is represented by a sample of companies operating in the Slovenian economy. Data for the study were collected during the survey “Cost management and contemporary management tools in Slovenian companies”, which was conducted in the summer of 2008 on a sample of 323 Slovenian companies. It was based on an extensive questionnaire that consisted of three parts. Part one was related to general information about the company (such as size, industry, number of employees, number of competitors etc.), part two investigated characteristics of performance management (e.g. importance of different financial and non-financial performance measures, usage of integrated performance management systems etc.) and part three dealt with knowledge about cost management systems (e.g. familiarity with different cost management systems). The questionnaire was fully structured, with pre-coded responses and after a careful consideration it was decided to fill in the questionnaires by using personal interviews with top or middle managers. Personal interviews were conducted by 160 specially trained interviewers¹. Each interviewer questioned 2-3 companies. When choosing companies to be included in the sample, we had no interest to exclude any company. However, our sampling technique corresponds to judgemental or purposive sampling (Churchill, 1999; Zikmund, 2000) as the population elements were selected based on the judgement of interviewers. Nevertheless, the sample is relatively big and offers a good representation of the whole population, as regards the geographical position of the companies and industry (branch) they belong to.

Before testing our research hypotheses we checked the accuracy of data and discovered some contradictions in numerical data (e.g. some companies reported that their return on assets was greater than return on equity). We therefore eliminated those cases from our final sample. Thus our final sample consists of 249 Slovenian companies, which is still an appropriate absolute sample size for both, principal component analysis and discriminant analysis (Hair, Black, Babin & Anderson, 2010). Our final sample consists of 82 (33%) micro companies, 46 (18%) small companies, 50 (20%) medium sized companies and 71 (29%) large companies. Companies are classified according to valid Slovenian legislation at the time of conducting the interviews². 38 per cent of the companies operate in manufacturing, 55 per cent in service industries and 7 per cent in other (non-classified) industries (e.g. non-profit organisations). 55 per cent of companies in the sample conduct their business also in foreign markets, while others operate only in Slovenia. The sample consists of 67 per cent limited liability companies, 24 per cent joint stock companies and 9 per cent other legal entities. 55 per cent of companies in the sample do not use any performance measurement systems, 40 per cent of companies use some form of IPMS (among these companies 13 per cent use the Balanced Scorecard), while 5 per cent of companies use other (non-classified) systems.

In order to test our research hypotheses, we used the second part of the questionnaire. In the survey we asked companies to evaluate the importance of 70 financial and non-financial performance measures using a five-point Likert scale ranging from 1 (meaning “not important at all”) to 5 (meaning “very important”). First, we wanted to find out whether the measures used by Slovenian companies can also be grouped according to four performance perspectives of the Balanced Scorecard and if yes – is there a significant difference in average overall importance of different perspectives between companies that use IPMS and companies that do not use such systems.

To examine whether the measures used by Slovenian companies can also be grouped according to four Balanced Scorecard performance perspectives, principal component analysis (PCA) is used. Before applying

¹ Interviewers were properly trained because the research was part of their postgraduate course work.

² “Micro company” fulfils two of the following criteria: average number of employees does not exceed 10, annual revenues are less than € 2 million, assets at the end of the financial year do not exceed € 2 million. “Small company” fulfils two of the following criteria: average number of employees does not exceed 50, annual revenues are less than € 7.3 million, and assets at the end of the financial year do not exceed € 3.65 million. “Medium company” is a company fulfilling two of the following criteria: average number of employees does not exceed 250, annual revenues account for less than € 29.2 million, average assets at the end of business year do not exceed € 14.6 million. Other companies were classified as “large companies”.

PCA we have to examine if the method is at all applicable. In the first step we check the correlation matrix. The common rule of a thumb is to exclude all variables that have correlation coefficients lower than 0.3 or higher than 0.7 (Hair et al., 2010). Due to very high inter-correlations³ we have to exclude all financial measures as well as some non-financial measures. Therefore, our final set of variables for PCA consists of 33 non-financial measures.

Table 1

Summary of Principal Component Results

	Rotated Component Loadings		
	Learning and Growth Perspective	Customer Perspective	Internal Business Processes Perspective
Labour productivity	0.828	0.158	0.213
Ratio of employees absent due to illness	0.719	0.143	0.046
Number of worker injuries	0.718	-0.176	-0.155
Use of working time	0.690	0.005	-0.039
Fluctuation	0.682	0.134	0.116
Ratio of highly educated employees to all employees	0.597	0.037	-0.057
Average age of employees	0.590	0.105	-0.016
Employee innovativeness	0.555	0.075	-0.124
Quality costs	0.542	-0.022	-0.304
Cost savings due to products' improvements	0.514	0.032	-0.313
Average number of customer complaints	0.460	0.010	-0.337
Environment management costs	0.440	-0.024	-0.345
Ratio of new customers to all customers	-0.003	0.878	0.001
Number of new customers	-0.134	0.816	-0.110
Number of active customers	0.171	0.797	0.112
Number of lost customers	0.211	0.737	-0.046
New customers' sales ratio	0.126	0.687	-0.133
Customer profitability	0.119	0.666	-0.059
Number of products (or services) removed	-0.110	-0.001	-0.886
Products (services) removal ratio	-0.059	0.018	-0.846
Number of new products (or services)	-0.150	0.315	-0.710
Time-to-market for new products	0.115	-0.001	-0.688
R&D cycle	0.143	-0.009	-0.644
New products' sales ratio	-0.131	0.368	-0.635
Costs of faulty products / services	0.308	0.014	-0.588
Average delivery time	0.170	0.041	-0.583
Revenue loss due to processes' errors	0.296	0.023	-0.516
Average customer size	-0.028	0.376	-0.511
Adequate quality of material	0.319	-0.058	-0.492
Average order value	0.040	0.289	-0.476
Percentage of unmet deadlines	0.357	0.101	-0.459
Increase in cost due to processes' errors	0.369	0.021	-0.434

³ By reason of large number of variables, table of correlations is not reported. However, authors can provide it on request.

Order fulfilment ratio	0.384	-0.027	-0.418
Eigenvalues	14.010	2.646	1.971
% of variance	42.454	8.018	5.973
Cronbach's α	0.903	0.904	0.942

Note: Component loadings over $|\pm 0.4|$ are considered significant and appear in bold.

Next, we test the adequacy of chosen variables using Bartlett's test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy (KMO). KMO (0.916) and statistically significant Bartlett's test ($P=0.000$) indicate that principal component analysis is appropriate. Also, KMO values for individual variables⁴ are all well above 0.50 (most of these values range from 0.85 to 0.95).

As far as the missing data are concerned, we first conduct missing value analysis and find out that great majority of missing data can be classified as ignorable ("skip patterns"). Taking into account the nature of missing data we exclude missing cases pairwise. Hence, regarding the sample size question, with the chosen method of exclusion of missing cases, the desired ratio of at least 5 observations per variable as proposed by Hair et al. (2010) is achieved, which further confirms that statistical requirements for principal component analysis are met. Therefore, we are able to test if analysed non-financial measures can be grouped according to three non-financial performance perspectives (customer, internal business processes and learning and growth perspective). We extract three components, using a priori criterion. Because the interpretation of components produced in the initial extraction phase is difficult, we also use oblique rotation (Direct Oblimin). Further, we also check if any outliers are present. We compute component scores, but none have values greater than $|\pm 3.0|$, so we are able to conclude that there are no outliers. Taking into account the sample size, component loadings of $|\pm 0.4|$ are considered significant for interpretative purposes, as suggested by Hair et al. (2010), even though nearly 80 per cent of component loadings are greater than $|\pm 0.5|$.

Table 1 shows component loadings after rotation (for interpretation purposes the results of pattern matrix are reported). The variables that group on the same component imply that component 1 roughly represents learning and growth perspective, component 2 represents customer perspective and component 3 represents internal business processes perspective. Three components explain around 60 per cent of the total variance. 70 per cent of communalities are greater than 0.50 (and the rest are all greater than 0.41), suggesting that more than 50 per cent of variance in each variable can be explained by the three components (see also Table 1 in Appendix A).

After we confirmed that non-financial measures used by Slovenian companies can also be grouped according to three non-financial perspectives from the Balanced Scorecard, we are able to test our first research hypothesis:

H1: Companies using IPMS put more emphasis on non-financial measures as opposed to companies that do not use such systems.

In order to test our first research hypothesis we create three new variables that comprehensively represent each of the already mentioned non-financial perspectives. We create these replacement variables by calculating the average score of variables that load highly on each of the three components produced in PCA (i.e. summated scales approach).

Since we had to exclude all financial measures from PCA, we also have to calculate variable representing the importance of financial perspective. We do that simply by calculating the average importance of all financial measures (i.e. return on assets, return on capital, revenues growth, profit growth, liquidity, revenues to cost ratio, solvency, profit margin, value added, economic value added, weighted average cost of capital, return on investment, value added per employee, total revenues per employee, earnings per share, profit per employee, share price, debt-to-capital ratio).

A reliability check for measures representing four performance perspectives yields a Cronbach's alpha of 0.842, indicating good reliability. Mean of all four perspectives is then calculated to represent average overall importance of different performance perspectives (i.e. average overall importance score).

Next, we examine if there is a significant difference in average importance of different perspectives between companies that use IPMS (Group 1) and companies that do not use such systems (Group 0). The

⁴ By reason of large number of variables, table containing KMO values for individual variables is not reported. However, authors can provide it on request.

results in Table 2 indicate that average overall importance of all performance perspectives is slightly higher for companies using IPMS than for companies, which do not use these systems. However, in order to statistically confirm this finding, also independent samples t-test is used. Levene's test for equality of variances proves to be statistically significant at $p \leq 0.05$ only for variable representing financial perspective, which means that this variable is tested under the assumption of unequal variances, whereas other variables are tested under the assumption of equal variances. With independent samples t-test the following hypothesis is tested (Churchill, 1999): $H_0: \mu_0 = \mu_1$ and $H_1: \mu_0 \neq \mu_1$. As can be observed from Table 2 the data allows us to reject null hypothesis and accept alternative hypothesis only for variables representing financial and learning and growth perspective, whereas for customer and internal process perspective the difference in average overall importance is not statistically significant. Also, if we calculate average importance of all non-financial perspectives as well as of all four perspectives (i.e. average overall importance score), we are not able to reject null hypothesis that there are no differences in means between two groups of companies.

Table 2

Group Statistics and Independent Samples t-test

	IPMS usage	Number of companies	Mean	Std. Deviation	t-test	Sig. (2-tailed)
Financial perspective	Do not use IPMS	149	3.5880	0.64346	-3.987	0.000*
	Use IPMS	97	3.8954	0.55403		
Customer perspective	Do not use IPMS	141	3.3781	1.00235	-0.500	0.617
	Use IPMS	96	3.4432	0.95445		
Internal business process perspective	Do not use IPMS	141	3.1295	0.96708	-0.446	0.656
	Use IPMS	95	3.1844	0.86570		
Learning and growth perspective	Do not use IPMS	145	3.2696	0.82914	-1.977	0.049*
	Use IPMS	97	3.4816	0.79996		
Non-financial perspectives	Do not use IPMS	148	3.2736	0.81645	-1.016	0.311
	Use IPMS	97	3.3790	0.75750		
All perspectives (average overall importance score)	Do not use IPMS	150	3.3559	0.72398	-1.672	0.096
	Use IPMS	97	3.5074	0.64823		

Note: * indicates $p < 0.05$

Overall, the results suggest that companies using IPMS do not put more emphasis on non-financial measures as opposed to companies that do not use such systems, even though the results from the independent samples t-test procedure indicate that there is a statistically significant difference in average importance of variable representing learning and growth perspective. Contrary to our expectations we are able to reject null hypothesis and accept alternative hypothesis also for variable representing financial perspective, even though we expected that the difference in means for this variable would not be statistically significant for two groups of companies.

Further, we also examine if it is possible to distinguish between two groups of companies (i.e. IPMS users and non-users) based on overall importance of different performance perspectives. Our second research hypothesis, which is tested using discriminant analysis, is the following:

H2: Based on overall importance of different performance perspectives we are able to distinguish between companies using IPMS and companies that do not use such systems.

Before applying discriminant analysis, we check if underlying assumptions of the chosen statistical method are met. The key assumptions for deriving discriminant function are multivariate normality of independent variables and unknown (but equal) dispersion and covariance structures for the groups as defined by the dependent variable (Hair et al., 2010). The issue of equal dispersion of the independent variables is tested via Box's M test, which reveals a non-significant probability level, so we are able to continue with analysis. As far as multivariate normality of independent variables is concerned, we discover a slight variation from the normal distribution, but since our sample size is relatively big, this variation from the normal distribution can be considered as negligible. Therefore, we apply discriminant analysis and obtain the following discriminant function:

$$Y_1 = -5.159 + 1.757 * F - 0.211 * C - 0.972 * I + 0.726 * L$$

where:

Y_1 = Discriminant function score; F = Financial perspective; C = Customer perspective; I = Internal business process perspective and L = Learning and growth perspective.

Wilks' Lambda shows statistically significant association between two groups of companies and predictors, with discriminant function accounting for 11 per cent of variance ($\lambda=0.9$, $\chi^2(4)=23.66$, $p=0.00$, canonical $R^2=0.1$). The standardised discriminant functions coefficients indicate the relative importance of four performance perspectives in predicting whether companies use IPMS or not. Financial perspective and learning and growth perspective have the largest relative contribution in predicting usage of IPMS, which is also in accordance with previous results. Namely, only for these two performance perspectives statistically significant differences between two groups of companies were found.

Furthermore, discriminant analysis enables us to predict group membership. Table 3 shows the prediction of group membership that identifies right and wrong classifications.

Table 3

Classification results

		IPMS usage	Predicted Group Membership		Total
			Do not use IPMS	Use IPMS	
Original	Number of companies	Do not use IPMS	84	50	134
		Use IPMS	35	59	94
	Percentage of companies	Do not use IPMS	62.7	37.3	100.0
		Use IPMS	37.2	62.8	100.0

By using discriminant function, we can correctly classify 62.7 per cent of original group cases.

As an assessment tool for the accuracy of classification we also use the "*I index*", which is an improvement-over-chance estimate. The "*I index*" indicates how much better than chance we can predict group membership and how much better we did by using a classification rule than by relying on chance assignment⁵ (Hwang, 2001). It can be calculated as follows:

$$I = \frac{H_o - H_e}{1 - H_e}$$

where:

H_o = the observed hit rate

H_e = the hit rate expected by chance

The observed hit rate (H_o) is calculated as the ratio between number of correctly classified cases (o) and the number of all cases (n), whereas the hit rate expected by chance (H_e) is the ratio between overall chance hit rate (e) and the number of all cases (n). From Table 4 it follows:

$$\begin{aligned} n &= 228 \\ o &= 143 \\ e &= \frac{84}{228} * 84 + \frac{59}{228} * 59 = 46.21 \end{aligned}$$

Therefore:

$$I = \frac{\frac{143}{228} - \frac{46.21}{228}}{1 - \frac{46.21}{228}} = 0.53$$

⁵ Chance rate is determined using proportional chance criterion.

Our calculation reveals that the value of “*I index*” equals 0.53. We conclude that by using a linear classification rule, about 53 per cent fewer classification errors are made than if classification is done by chance. Even though the magnitude of “*I index*” is a matter of judgement (Huberty, 1994), we argue, that on the basis of overall importance of different performance perspectives, we are able to predict group membership and distinguish fairly well between both groups of companies.

In addition we also examine if companies using IPMS put equal emphasis on different performance perspectives or is there any weighing bias. Our last research hypothesis is therefore stated as follows:

H3: Companies using IPMS put equal emphasis on different performance perspectives.

The balance between different performance measures is estimated via standard deviation of average overall importance score. A large standard deviation indicates that four perspectives are not weighted equally, while a small standard deviation suggests that there is little weighing bias and that importance of each performance perspective is similar to the average overall importance score. In other words, the lower the standard deviation of the average overall importance score, the more equally balanced is the importance of different performance perspectives. Due to the fact that the value of standard deviation indicating presence of weighting bias is a matter of judgement, we test our last research hypothesis using independent samples t-test. We expect that there will be a statistically significant difference in the mean of standard deviation between both groups of companies. Namely, we anticipate that on average companies using IPMS have lower standard deviation as opposed to companies that do not use these systems. Levene’s test is not significant, which means that our third research hypothesis is tested under the assumption of unequal variances. The results indicate that on average companies using IPMS have higher standard deviation as opposed to companies not using such systems, but this difference is not statistically significant (see Table 4).

Table 4

Group statistics and Independent Samples t-test

	IPMS usage	Number of companies	Mean	Std. Deviation	t-value	Sig. (2-tailed)
Standard deviation of overall importance score	Do not use IPMS	148	0.5216	0.28787	-0.732	0.465
	Use IPMS	97	0.5496	0.30005		

Contrary to our expectations the results suggest that companies using IPMS do not put equal emphasis on different performance perspectives. Moreover, companies that do not use IPMS seem to have less weighting bias in the importance of different perspectives as opposed to companies using IPMS, which is not in line with our expectations. However, previous results (see Table 2) imply that on average importance of every performance perspective is slightly higher for companies using IPMS than for companies, which do not use these systems.

4. ANALYSIS OF RESEARCH RESULTS

Using data from a survey of Slovenian companies, we investigated how importance of different performance perspectives differs between companies using IPMS and companies that do not use such systems. Reflecting theoretical background and previous research findings (Boulianne, 2008; Chenhall & Langfield-Smith, 2007; Ittner, Larcker & Meyer, 2003; Kaplan & Norton, 1996; Moers, 2005) we expected that IPMS users put much more emphasis on non-financial perspectives as opposed to the companies that do not use such systems. On the other hand, we did not expect statistically significant difference in average overall importance of financial perspective between both groups of companies. Contrary to our expectations, our research findings imply that there is a statistically significant difference in the average overall importance of financial perspective between both groups of companies, whereas for non-financial perspectives, statistically significant difference is found only for variable representing learning and growth perspective. Depending on existing theory (Bourne et al., 2003; Hoque & James, 2000; Michalska, 2005), which implies that companies not using IPMS measure their performance mainly on the basis of financial measures, whereas companies using IPMS measure their performance based on multiple performance

perspectives, our research results are rather surprising. Namely, the empirical results suggest that both groups of companies differ only with respect to the emphasis they put on financial and learning and growth perspective. Implicitly this could mean that Slovenian companies use IPMS inefficiently, because they still perceive financial performance measures as more important than non-financial (see also Marc et al., 2010; Peljhan et al., 2006 where we found similar results). One possible explanation regarding the results about the importance of non-financial perspectives is also that companies not using IPMS actually measure their performance from multiple performance perspectives, even though this explanation seems to be less likely. Also, companies not using IPMS may be neglecting financial perspective by not measuring it systematically, which would explain why statistically significant difference in average overall importance of financial perspective is found.

Next, we also wanted to know, if it is possible to predict group membership (i.e. IPMS users and non-users) based on average overall importance of different performance perspectives. By using discriminant function, we are able to correctly classify 62.7 per cent of original group cases. As an assessment tool for the accuracy of classification we also used an improvement-over-chance estimate. Our calculation reveals that by using a linear classification rule, about 53 per cent fewer classification errors are made than if classification is done by chance. Even though the magnitude of this result is a matter of judgement, we conclude, that on the basis of overall importance of different performance perspectives, we are able to predict group membership and distinguish fairly well between both groups of companies. Furthermore, our results also suggest that financial perspective and learning and growth perspective have the biggest relative contributions in predicting usage of IPMS, which is in accordance with previous results. Namely, only for these two performance perspectives statistically significant differences between both groups of companies were found.

Furthermore, we also investigated whether companies using IPMS put equal emphasis on different performance perspectives or is there any weighing bias. The results are inconsistent with our research hypothesis that companies using IPMS put equal emphasis on different performance perspectives (Boulianne, 2008; Ittner, Larcker & Meyer, 2003; Moers, 2005). Namely, our empirical results imply that companies using IPMS have higher standard deviation of overall importance score as opposed to companies not using IPMS. This suggests that companies not using IPMS measure different performance perspectives in a more balanced way as opposed to companies using such systems. However, our results (see Table 2) also imply that on average importance of every performance perspective is slightly higher for companies using IPMS than for companies, which do not use these systems.

In sum, the empirical results confirm our second research hypothesis (i.e. we are able to distinguish fairly well between IPMS users and non-users), whereas our first and third research hypotheses are not confirmed by our research findings (i.e. IPMS users do not put more emphasis on non-financial measures as opposed to IPMS non-users; moreover, these companies also seem to measure different performance perspectives in a less balanced way than IPMS non-users). However, based on our results, we are not able to conclude, that Slovenian companies use IPMS ineffectively. Namely, our findings should be interpreted with certain limitations in mind. First of all, we test all our hypotheses on average values of all variables. It is possible that results of Group 1 are biased by companies that ineffectively use IPMS, which is why the results of our empirical analysis may not reflect the real circumstances. Furthermore, results of the study may also be biased by some design choices made regarding the questionnaire. Also, the generalisation of research results is limited because only Slovenian companies are included in the survey. Finally, there is also possibility that companies emphasise specific performance perspectives in order to enhance their performance in areas where they might currently be underperforming, which would explain why we were unable to confirm our first and third research hypotheses. In spite of this, our study begins to reveal possible reasons that could influence the effectiveness of IPMS.

5. CONCLUSIONS

The purpose of the study was to find out whether the measures used by Slovenian companies can also be grouped according to four BSC's perspectives and if yes – is there a significant difference in average overall importance of different perspectives between companies that use IPMS and companies that do not use such systems. Also, we examined whether performance perspectives are weighted equally by companies using IPMS or is there any weighing bias.

Overall, the results confirm that non-financial measures can be grouped according to proposed non-financial perspectives. Also, the average overall importance of different perspectives differs between companies that use IPMS and companies that do not use such systems, even though this difference is statistically significant only for financial and learning and growth perspective. Furthermore, the results indicate that different perspectives are not weighted equally and weighting bias appears to be greater for companies using IPMS than for companies not using such systems.

The literature review revealed a deficiency of empirical studies about actual importance of different performance perspectives in IPMS. Our study fills this gap by analysing a large sample of Slovenian companies and provides relevant empirical findings regarding possible issues that could potentially influence also the effectiveness of IPMS. Moreover, the study exposes some interesting relationships that require further research. Further research should therefore focus on studying the relationship between IPMS's effectiveness (e.g. improved financial performance) and overall importance of different performance perspectives. In order to get a better understanding of this issue, case study approach should also be used in the future.

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APPENDIX

Appendix A: Additional PCA Results

Table 1

Communalities (Extraction Method: Principal Component Analysis)

	Initial	Extraction
Number of active customers	1	0.678
Ratio of new customers to all customers	1	0.769
Number of lost customers	1	0.739
Customer profitability	1	0.559
New products' sales ratio	1	0.632
Average delivery time	1	0.498
Average customer size	1	0.543
Percentage of unmet deadlines	1	0.584
New customers' sales ratio	1	0.662
Average number of customer complaints	1	0.493
Revenue loss due to processes' errors	1	0.529
R&D cycle	1	0.525
Environment management costs	1	0.458
Use of working time	1	0.508
Increase in cost due to processes' errors	1	0.504
Fluctuation	1	0.466
Labour productivity	1	0.636
Average age of employees	1	0.415
Employee innovativeness	1	0.438
Ratio of highly educated employees to all employees	1	0.414
Adequate quality of material	1	0.475
Ratio of employees absent due to illness	1	0.572
Quality costs	1	0.545
Average order value	1	0.455
Costs of faulty products / services	1	0.639
Number of new customers	1	0.680
Number of new products (or services)	1	0.670
Number of products (or services) removed	1	0.695
Products (services) removal ratio	1	0.679
Time-to-market for new products	1	0.569
Number of worker injuries	1	0.574
Cost savings due to products' improvements	1	0.550
Order fulfilment ratio	1	0.473