

Ágnes SZUKITS

# MANAGEMENT CONTROL SYSTEM DESIGN

## THE EFFECT OF TOOLS IN USE ON THE INFORMATION PROVIDED

Today's organizations have a wide variety of tools at hand to provide relevant information to management that can be used later on for various purposes, including performance evaluation and decision making. This paper investigates the range of management control (MC) tools in use and its relationship to the scope and frequency of information made available to management. As the work of controllers in the 21st century is intensively supported by diverse IT solutions, the tools under analysis are not limited to MC instruments. IT systems as enablers of well-designed MCSs are also considered. Multivariate analysis of the 2013 questionnaire from the "Competing the world" Research Program revealed a significant positive correlation between the use of MC tools and diverse informational features of MC systems. However, only a limited effect for IT intensity on information provision was proved for the 181 Hungarian, mainly mid-size companies in the sample. The results of discussions with senior controllers about some unexpected findings are also reported.

*Keywords:* management control system, management information, IT systems

Fundamental changes in the external environment provoke changes in the organizations as well. The economic crisis after 2008 and its consequences have accelerated many changes in the management control routines of business corporations (Weber – Zubler – Rehring, 2010). Some authors claim that this was the biggest concussion ever that altered both management control systems (MCS) and the nature of controllers' work in the organizations (Tirnitz, 2010).

As a consequence of increased environmental uncertainty, companies have been forced to be more forward-looking and to focus not only on internal events in the life of the company but to monitor the external environment more intensively. Therefore, one feature of MCS has become a special focus of interest: the changing information requirements of management and the ability of MCS to fulfil these new requirements.

When providing diverse sets of information to managers, controllers use diverse tools to support these activities (Ahrens – Chapman, 2000). How are the tools that are in use linked to the information provided by the MCS? This paper investigates this link between the tools and the nature of the information that is provided: are companies adopting a wider range of advanced MC practices which are able to provide a broader scope of information to management?

When discussing modern MCS one must be aware that they are embedded in IT systems and cannot be operated without intensive IT support. Acknowledging this important factor, not only formal MC tools are hereby considered, but the intensity of the use of innovative IT tools as well.

There are numerous contingencies that influence companies' management control systems. The main drivers of MCS are both external (changing business market conditions and new managerial philosophies) and internal (organisational re-design, corporate culture, the implementation of management technique innovations, and human resource developments) (Burns – Baldvinsdottir, 2005). These contextual factors of MCS have been intensively researched since the 1980s. While recognizing the importance of the wider context, this paper does not explicitly discuss the environmental context and other influencing factors; the focus is more on the relationship between the tools and the information used in MCS.

In the remainder of this paper, prior research findings about applied tools are reviewed. Subsequently, a discussion about the nature of the information that is generated is provided. At the end of the literature review section, IT systems as an enabler of MCS are introduced. Finally, research gaps are identified. Derived

from understanding of these gaps, a research question with four sub-hypotheses is formulated, which are then tested on the most recently available database from the “Competing the World” research program. The results of the statistical analysis and results of the focus group discussions with 20 senior controllers are presented with conclusions.

### Literature review

A management control system is conceptualized in this paper as a formalized control subsystem designed to provide information to managers (Otley, 1980; Bouwens – Abernethy, 2000). Objectivist research characterizes formal management control in two ways: through its tools (also referred to as instruments, techniques or practices) and the information provided by the tools.

Prior literature of *MC tools* either concerns what can be considered an MC tool, and/or it investigates how MC tools can be classified. Typologies based on the tasks served by the tool (budgeting, costing, etc.), by time horizon (strategic and or operative) or by level of innovation (traditional vs. new/innovative/advanced) are widely employed. The current paper focuses more on examining the innovativeness of the tools.

Traditional MC practices (such as the techniques of cost variance analysis, overhead allocation or financial KPIs) create the foundation for the discipline. These traditional techniques focus on company-internal events, are monetary-oriented and are less capable of providing non-financial information or taking a strategic focus.

Scholars have claimed that traditional tools are no longer suitable for use in the organisations of the 21st century (Chenhall – Langfield-Smith, 1998; Joshi, 2001). Firms operate in a more intensive, globally competitive environment, technology changes rapidly and new management approaches are continually emerging. The needs of managers facing these new challenges cannot be met by using traditional MC tools. New, advanced practices are required in order to maintain the relevance of formal MC (Johnson – Kaplan, 1987).

Whether traditional or advanced, the range of applied management control practices can differ among countries. Some difference between the tools that are applied is evident in the transition countries of Central and Eastern Europe (CEE). CEE countries could have been characterized by their special institutional, legislative, and cultural contexts (considerably different from the USA and Western European countries) over the first decade after the transition (Dobák, 2006; Dobák – Steger, 2003). Around the millennium, researchers claimed that MCSs in CEE were still at the

initial stage of development, and much more emphasis was given to the development of financial accounting (Haldma – Lääts, 2002).

In post-socialist Hungary, the first MCS were largely built on inherited systems, but their managers wanted them to be suitable for meeting new requirements such as reporting to foreign owners (Bodnár, 1997; Lázár, 2002). Using the case of a formerly government-owned and production-oriented Hungarian company, it has been proved that some tools (such as calculation practices) were being used before the transition that followed almost the same procedures as after it. The novelty was thus not related to the technology, but to the purpose of use. Changing from a command to a market economy altered fundamentally the purpose of management control (Vámosi, 2000, 2003).

New MC tools, not formerly used during the socialist era, were slowly adopted by companies. As stated in 1997, the management control practices of Hungarian companies was similar in many ways to that of US companies 10-15 years before (Dobák – Bodnár – Lázár, 1997). How the management control toolkit of Hungarian organizations changed between 1996 and 2004 was detailed by Bodnár et al. (2005). These authors concluded that a slight shift towards more innovative practices can be identified, but the dominance of traditional MC tools still prevailed.

Using survey data from 301 organizations from the “Competing the world” research program, (data refer to 2004), three clusters of companies were identified based on their choice of MC tools. The “Planners” cluster could be characterized by their intensive use of strategic planning and budgeting tools and generally high adoption rates of MC tools. This cluster accounted for 34.5% of all companies. “Reporters” differentiated themselves through employing well-used and sophisticated feedback mechanisms. “Lagging companies” were characterized through their low adoption of MC tools in all fields. This cluster was the largest, involving 42% of all companies (Dankó – Kiss, 2006).

Zárda (2009) claimed that the main reason for the lagging behind of Hungarian companies was the old-fashioned attitudes of corporate executives. Forty years of socialism is still affecting ways of thinking and retarding the internalization of new approaches. Attitudes and the orientation of executives need to be changed in order to further develop MA and MC systems in Hungarian enterprises.

Meanwhile, Wimmer (2000) reported that the internationally adopted approach of field performance measurement had already spread throughout Hungarian enterprises, although the use of the relevant tools is lagging. The focus of performance measurement is still on the past. Management reports dominantly involve

data obtained through financial accounting practices. Non-financial aspects of performance, such as quality or customer satisfaction, are neglected. External data is only partially provided to management.

In a later piece of research by the same author, improvements in many areas are reported. For example, Wimmer and Csesznák (2012) investigated some formal MC tools (referred to as ‘methods’) which are intensively used in Hungarian companies. These authors report on the frequency of usage of tools that focus on performance measurement and operational analysis. The adoption rates of traditional tools remained nearly unchanged over this time period. New, innovative practices such as target costing (39.3% adoption rate), economic-valued added (28.0%) and Balanced Scorecard (22.1%) are now known and used in many of today’s Hungarian companies, but the use of traditional tools still dominates.

Variation in the use of the tools applied at the different companies is often explained by both external environmental and internal organisational characteristics. As referred to in the introduction, there is an extensive body of literature about contingencies that influence management control practices. Chenhall (2003) provides a detailed review of contingency studies about MCS; for some later developments, see Abdel-Kader and Luther (2008).

Multiple lines of evidence suggest that foreign ownership is one of the most important external factors when it comes to what influences the MCS of Hungarian companies (Bodnár, 1999; Lázár, 2002; Dankó – Kiss, 2006). Besides external factors, firm size (an internal contingency) is one of the most important variables as concerns the adoption of MC tools. Put simply, larger organisations are more likely to use more tools. This fact can be explained by organizational theory. Larger organisations typically undertake tasks of higher complexity that require the division of labour and specialization of tasks. Specialization leads to the differentiation of organizational function that in turn requires coordination and integration of diverse activities. Coordination and integration are supported, among other ways, by formal MC practices (Chenhall – Langfield-Smith, 1998). Another often mentioned reason is that large firms have more resources and are therefore more willing to experiment with new innovations, such as contemporary MC tools.

Based on a sample of Hungarian profit-oriented organisations, Bodnár (1999) identified a significant positive relationship between the use of ‘controlling’ tools and company size, and, respectively, the use of tools and the level of diversification. Companies with a limited range of activity and companies of smaller size tend to apply less advanced MCS (Bodnár, 1997).

Larger companies more intensively use budgeting and planning tools than smaller firms. Differences in the adoption rates of costing tools between firms of different size prove to be less significant (Dankó – Kiss, 2006).

When describing the MCS of an organisation, the tools that are used are often listed. However, the mere provision of a list of practices that are in use does not provide much information about the appropriateness of the MCS. Accordingly, MCSs are usually characterized using other terms as well: particularly by the *scope of information provided* (Chong, 1996; Gordon – Narayanan, 1984). The scope of information can be described using three main characteristics:

- the focus of information: external vs. internal information,
- the level of quantification: non-financial vs. financial information,
- the time horizon: ex ante vs. ex post (past-oriented) information.

Information of an internal nature focuses on events within the organisation, while external information relates to the organisation’s environment. Financial information is expressed in monetary terms, while non-financial information cannot be this way expressed. Ex-ante information is future-oriented and deals with future events, while ex-post information is past-oriented and relates to historical data.

Traditional MCS with a narrow scope of information mainly generate internal, financial, ex post information. In contrast, broad-scope MCS include information related to the external environment, estimates about the future, and measures that are not exclusively limited to monetary terms (Chenhall – Morris, 1986). These types of information are provided by broad scope MCSs not instead of but in addition to internal, financial and ex post information (Gordon – Narayanan, 1984).

Providing additional information might increase the length of the reports and can be even contra productive: if executives lose the focus, providing more information cannot lead to better informed management decisions. As Weber and his colleagues (2010) also stated, keeping the focus is vital: companies strongly affected by the economic crisis succeeded in decreasing the size of their management reports.

Whether traditional or broad scope, MCS cannot be operated without the intensive support of *information technology* (IT). Information systems enable the efficient use of MC tools and the user-friendly provision of information to management. The first MC-related task supported by IT systems was data-processing, while

nowadays (almost) the whole spectrum of a controller's tasks is facilitated by diverse IT applications (Drótos, 2010). MC systems are increasingly embedded in IT systems. Therefore, while describing the MCS design of a firm, IT characteristics must be recognized, in addition to the specific MC tools that are being used, and the information they provide.

Research that focused on the relationship of information systems to MC became popular after the widespread adoption of enterprise resource planning (ERP) systems in the 1990s. The effects of ERP on diverse aspects of management accounting (MA) and control systems have been investigated, but the first studies indicated only a very moderate impact of ERP implementation on MC/ MA.

In their cross-sectional field study, Granlund and Malmi (2002) analysed the impact of ERP on management accounting and control procedures. In contrast with prior expectations, they found that ERP had a modest impact. MC techniques (not only advanced techniques but traditional ones too) were not integrated into the implemented ERP. Consequently, the implementation of SAP systems had not fundamentally changed the MC information that was being provided (Scapens – Jazayeri, 2003).

Ten years later, researchers still report to finding the similarly moderate effect of ERP on MC tools and information. Based on a case study in an SME context, ERP was found to be able to support the “standardized financial accounting transparency, no more” (Teittinen – Pellinen – Järvenpää, 2013, p. 294.). The lack of impact was rationalized by studies using the theoretical lens of institutionalism which referred to resistance to change: the old MA system was simply built into the new IT infrastructure without changing the content (T. Hyvönen – Järvinen – Pellinen – Rahko, 2009).

MA and MC-related activities are more often supported by processes outside of ERP such as data warehouses, executive portals or software packages specialized in the support of BSC techniques (Rom – Rohde, 2007). Therefore, a higher impact for MC techniques and information is expected in this field. Despite this, research that has investigated the interface between non-ERP IT solutions and MC is very scarce. One early exception is the investigation of Strategic Enterprise Management (SEM) as an add-on to ERP, although the focus was placed more on the success of the implementation phase than on the MC-related consequences (Brignall – Ballantine, 2004).

Most recently, first studies into the innovative use of internet-based technologies such as cloud computing services have been published in international academic journals. However, the link to management control is again missing from these publications. They

either still have a financial accounting focus and report (for example) about the benefits and risks from the auditor's perspective (Yigitbasioglu, 2015) or they try to establish a direct link to business performance (Prasad – Green, 2015).

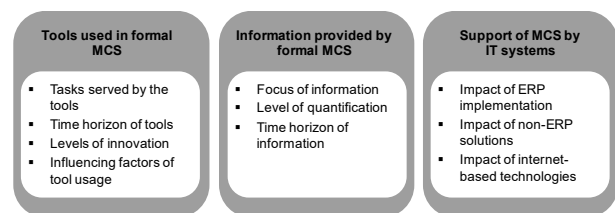
Importance of the IT background was emphasized by Tirnitz (2010) from another point of view. He claimed that due to the turbulent environment an increasing time pressure is put on reporting. Shorter time available for preparing the month-end reports requires the better utilization of the capabilities of the underlying IT systems.

Is there a uni- or a bidirectional relationship between IT and MC? Information systems and management control systems coexist in organisations and evolve simultaneously. This situation assumes a more bidirectional relationship. However, most of the research that has focused on the interplay of IT and MC implies a unidirectional relationship (i.e. that IT impacts and enables MA and MC). While researchers acknowledge the existence of bi-directionality, they emphasize that information systems are more likely to have an effect on MC simply because, once implemented, IT systems are not so easy to change (Rom – Rohde, 2007). For example, in an ERP environment the configuration process defines what can and cannot be done later on with the system.

In line with this observation, my research model focuses on IT more as an independent construct that impacts management control. The logic is that innovative IT solutions can enable the efficient use of management control techniques and together become able to support the process of providing information to management. Some research into this subject already exists, but it tends to involve single case studies which have been used to investigate the effect of a concrete software package (e.g. how an ERP-linked ABC system was able to mediate management accounting knowledge (T. Hyvönen – Järvinen – Pellinen, 2006)). There is scarce evidence in the literature about whether and how modern, innovative IT solutions are able to influence the nature of MC information, which is provided. Similarly, there is a lack of evidence about the link be-

Figure 1

### Three lines of literature under review



tween MC tools and the nature of information that is provided, when not mediated through a specific tool such as ABC or BSC.

### Research model and results

Derived from the identified research gaps, the following main research question was identified: Is the intensive use of MC and IT tools linked to the ability to provide relevant MC information to management? In order to answer this question, both quantitative and qualitative techniques were used, thereby drawing on the idea of method triangulation. Firstly, data from a 2013 questionnaire survey was analysed using multivariate statistical methods that are widely employed for theory testing in MC research (Van der Stede – Young – Chen, 2005). Secondly, findings from quantitative analyses were presented and interpreted with the help of practitioners during focus group sessions in February and March 2016. In three sessions, each of which lasted 120 minutes, a total of 20 senior controllers from various industries with MC-related work experience of 7-25 years participated and facilitated the better and deeper understanding of the research findings.

### Hypotheses

Management control systems are characterized by the tools they use and the information they provide. Meeting the information requirements of managers forces controllers to apply a range of MC tools. It is argued in the literature that innovative tools are required to meet the newly-emerging information requirements of managers. I characterise MC tools on the basis of whether they were originally designed to provide broad scope information or not. An advanced MC tool is designed to provide external and/or non-financial and/or future-oriented information that goes beyond internal financial data. However, tools that are labelled new and innovative (such as BSC or target costing) are already 20-40 years old. Recent innovations in information systems that enable efficient MC are increasingly prevalent.

This research investigates whether the IT and MC toolkit of companies can be associated with the scope and frequency of information that is provided. Reflecting on the above-described research question, it is hypothesised that the more intensive utilization of advanced MC practices and innovative IT applications will support the frequent provision of broad-scope information. The research question sub-hypotheses are thus the following:

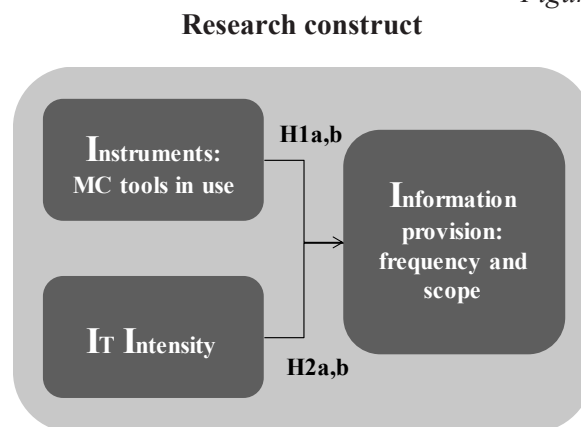
*H1a: Applying advanced MC tools supports the provision of a wide range of information to management.*

*H1b: Applying advanced MC tools supports the frequent provision of information.*

*H2a: High IT intensity supports the provision of a wide range of information to management.*

*H2b: High IT intensity supports the frequent provision of information.*

Figure 2



### Database and sample characteristics

The cross-sectional survey was conducted as part of a larger project named ‘Competing the world’. This research program was launched by the Institute of Business Economics at the Corvinus University of Budapest with the aim of researching the competitiveness of Hungarian enterprises. The first survey in 1996 (Chikán – Czakó – Demeter, 1996) was followed by further surveys in 1999 (Czakó – Wimmer – Zoltayné Paprika, 1999), 2004 (Lesi, 2004), 2009 (Chikán – Czakó – Zoltayné Paprika, 2010) and 2013 (Chikán – Czakó – Wimmer, 2014).

The current research uses a database generated by the 2013 survey and focuses on a limited set of variables and a reduced sample size. The final restricted sample involves 181 companies. The original sample of 300 organisations was reduced in size as a number of them did not contribute to the analysis. Although MC-like activities can be found even at micro-size and small companies, the application of formal management control practices is characteristic of mid-size, and more typically, large companies. Firstly, the sample was reduced using a size variable (number of employees). Secondly, organisations for which there were many missing values were removed from the sample to increase the validity of the analysis.

As for some relevant parameters data was lacking, and non-responses decreased the effective sample size, the danger of non-response errors arose. Failing to complete the questionnaire indicates that respondents might have had no opinion because they felt the ques-

tions to be irrelevant to their organisation. Respondents with insignificant management control activities omitted answering certain questions. Additionally, non-response errors occurred when companies refused to take part in the survey. As the reasons that companies refused to participate (and the characteristics of such companies) are unknown, concerns about validity were addressed through a process of method triangulation.

The research thus focuses on examining mid-size companies from traditional industries. The majority of companies (85.1%) in the restricted sample are mid-sized; 27 (14.9%) of them are large companies with respect to their number of employees. 78.5% of the organisations in the sample are under Hungarian ownership, of which 7.7% are state-owned. 21.5% of the firms are foreign-owned. In terms of the industrial distribution of the companies, processing industries are significantly overrepresented (45.9%; cf. 7.59% of the total population).

To operationalize the research construct, a diverse set of variables was employed. Assessment of both the MC instruments and MC information is based on the responses of CFOs. Questions related to IT Intensity were answered by COOs.

**Results of the statistical analysis**

Increasing numbers of MC tools are reportedly being used; researchers may be interested in the number and/or type of tools, which are really being used in practice. This research focuses on a limited list of MC instruments, which proved to be applicable and relevant to the Hungarian companies in the former surveys.

From the 17 tools listed in the questionnaire, six tools can be seen as more innovative, focusing on

broad-scope information. All the other tools may be categorized as traditional, focusing on internal, financial data. Companies in the sample use an average of 8.5 tools out of the potential 17, and 2 out of 6 advanced tools. Table 1 ranks the MC tools by their rates of use. Modified usage rates have been calculated based on the total (as a percentage), meaning that zero values have been interpreted as non-use. Advanced tools are indicated in grey.

Table 1 clearly verifies the dominant presence of traditional techniques in the daily practice of firms, and indicates that traditional techniques are not being replaced but expanded by the newer tools. This concept of expanding (instead of replacing) assumes that there is a certain structure in the reported values: significant association is likely between the number of traditional tools in use and the number of ‘broad scope’ tools that are in use.

Two variables were calculated from the original variables. The number of traditional tools (No\_TRADtoolsinuse) is the sum of variables related to traditional techniques (with the values 0=non-use and 1=in use). Similarly, the number of advanced, broad scope tools (No\_BROADtoolsinuse) is the sum of variables related to advanced techniques. Based on a Chi-square test, independence between the variables can be rejected (p=0.000), and Kendall’s tau-b measure association indicates a moderate strength of relationship (0.521, p-value=0.000).

Table 2

**Crosstabulation of MC tools in use**

Count		No_BROADtoolsinuse						Total	
		.00	1.00	2.00	3.00	4.00	5.00		6.00
No_TRADtoolsinuse	.00	5	0	0	0	0	0	0	5
	1.00	3	2	0	0	0	0	0	5
	2.00	3	1	0	0	0	0	0	4
	3.00	4	5	3	1	0	0	0	13
	4.00	1	8	4	3	0	0	0	16
	5.00	1	6	4	1	0	0	0	12
	6.00	9	2	5	3	1	0	0	20
	7.00	2	4	4	8	1	0	0	19
	8.00	2	0	8	4	2	0	0	16
	9.00	1	3	2	3	0	0	2	11
	10.00	0	2	4	3	4	1	0	14
	11.00	0	1	0	1	2	2	11	17
Total		31	34	34	27	10	3	13	152

Table 1

**Ranking of MC tools by rate of use**

	Usage rate (%)	Modified usage rate (%)
<b>Formal management control tools</b>		
1 n) analysis of financial indicators	82,6	78,5
2 a) cash-flow analysis	78,6	75,1
3 b) fix/variable cost differentiation	71,5	68,0
4 h) analysis of inventory turnover ratio	67,8	64,1
5 i) analysis of customer turnover ratio	60,5	57,5
6 j) analysis of supplier turnover ratio	55,6	51,9
7 c) breakeven analysis	55,5	53,0
8 p) analysis of cash-flow based indicators	54,8	50,8
9 m) capital cost analysis of investments	54,4	50,8
10 e) activity-based costing	53,0	49,2
11 d) cost sensitivity analysis	48,8	45,9
12 f) target costing	39,3	36,5
13 q) analysis of market value indicators	39,1	36,5
14 g) cost based supplier evaluation (e.g. TCO)	32,7	30,4
15 o) EVA or other residual indicators	30,4	28,2
16 k) cash conversion cycle	22,3	20,4
17 l) Balanced Scorecard	16,9	15,5

The concept of expanding means that broad-scope tools are more likely to be used at companies in which traditional tools were already being used. This phenomenon is reflected in Table 2. The upper triangle of the data matrix is filled with zero and close-to-zero values. This means that only those companies who are very actively using numerous traditional tools report to also using more broad-scope tools. The lower triangle indicates a more heterogeneous picture. Companies who are extensively using traditional tools are not necessarily adopting (more) newer techniques. Conse-

quently, the use of broad-scope tools is linked to the extensive usage of traditional tools, but the extensive usage of traditional tools does not necessarily lead to the adoption of newer techniques.

The application and integration of all available tools into MCS is not expected and does not necessarily lead to a 'better' MCS per se; however, the appropriate number of tools is also not easy to determine. Based on the database, companies which use at least 3 different advanced tools are designated 'intensive users' of advanced tools (35% of total sample). Companies reporting to using 1 or 2 advanced tools are specified as 'beginners' (43.9%), and others 'non-users' (21%).

A new categorical variable (CAT\_BROADtools-use) was calculated to represent the above-described groups of companies. The new variable has a value of 0 in the case that no advanced tools are used. Firms using 1-2 tools are awarded a variable value of 0.5 and intensive users with at least 3 tools in use have a variable value of 1.

Similarly, a categorical variable was calculated to represent the three types of companies with respect to the use of 14 diverse categories of IT applications listed in the questionnaire: non-users (0), beginners (0.5) and intensive users (1).

While the independent variables in the model are measured using categorical variables, dependents are measured using continuous intensity variables. Dependents include frequency of reporting and the three components of broad-scope information: external focus, non-financial information, and future orientation. Each of the dependent constructs represents a latent category that was measured through several underlying observable variables:

*Intensity of frequent information provision* was calculated using a composite of 8 variables that measure the frequency of issue of diverse reports to management. *Intensity of external focus* in data provision was calculated by combining five observable variables. Information is externally focused if it relates to data obtained from external analysis, reports from external sources, information based on customers' opinions, information from suppliers or information based on the opinions of other stakeholders (e.g. local communities).

*The non-financial nature of information* was measured using a set of six variables. Information is of a non-financial nature if it relates to number/quantity of sales, service/product quality, service time, timeliness of order deliveries, resource utilization or customer satisfaction. *Future orientation* was expressed in terms of the extent of planning activity and in terms of extent of the preparation of pre-calculations. The extent of planning activity is measured by the number of different plans/budgets prepared out of nine plans that are

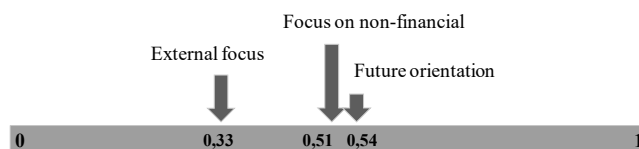
generally used, while the extent of pre-calculations is measured by the number of different pre-calculations prepared out of the four listed pre-calculation types.

Intensity measures were calculated for each of the four dependent constructs as the weighted average of the underlying observable variables. Weights were derived from a Principal Component Analysis (PCA). The factor loadings of the PCA output are the correlation measures between the original variables and the latent components. Consequently, these loadings were used as weights to represent the relative importance of the observable variables that influence the overall intensity measures.

Figure 3 illustrates the central tendencies of these information-related intensity measures on a continuum from 0 to 1. Having an external focus lags far behind having a focus on provision of non-financial and future-oriented information.

Figure 3

### Evaluation of MC information provided with respect to scope



The mean value of reporting frequency indicates that companies in the sample prepare reports on a quarterly basis, on average. It is important to note that the overall frequency includes both the frequency of issuing top management reports (more frequent) and functional reports (like IT, marketing etc., issued more rarely).

Hypotheses were tested by comparing the variances of the dependent variables in  $k$  independent groups. ' $k$ ' equals 3, representing the three groups of companies developed earlier with respect to the intensity of use of MC tools and IT applications. Distributions of the dependent intensity measures are non-normal across companies. As the normality assumption of parametric tests is violated, a non-parametric Kruskal-Wallis test was first employed. As regards the intensity of use of MC tools, the test suggested rejecting the null hypothesis of independence for all of the four intensity measures ( $p=0.002$  for external focus,  $p=0.000$  for non-financial information,  $p=0.000$  for future orientation, and  $p=0.001$  for reporting frequency). In terms of IT intensity, the Kruskal-Wallis test suggested rejecting the null hypothesis for reporting frequency and future orientation but retaining it for external focus and non-financial information, meaning that IT intensity is not related to these variables.

While the rejected  $H_0$  of the Kruskal-Wallis test rules out the lack of a relationship between the variables, it is not able to measure the strength of any relationship. Eta-squared, the effect index of ANOVA, can indicate effect size. MANOVA procedures, so as the univariate ANOVA assumes the existence of a normal distribution but they are fairly robust to departures from normality (Rencher, 2002). Therefore, eta-squared ( $\eta^2$ ) may be used in the case of a non-normal distribution of data to measure strength of association. Table 3 shows the eta-squared measures calculated as the ratio of between-groups sum of squares and the total sum of squares.

ables, but it might be used to interpret the directional relationship between the independent variable and the dependent variable.

The effect sizes listed in Table 3 can be interpreted as follows: the intensive use of advanced MC tools supports reporting frequency ( $\eta^2=0.0975$ ) and all aspects of broad-scope information provision ( $\eta^2=0.1040$ ;  $0.1064$ ;  $0.1851$ ).  $H_{1a}$  and  $H_{1b}$  are thus supported. Intensive use of MC tools has the largest effect on future orientation among all components of MCS design ( $\eta^2=0.1851$ ).  $H_{2b}$  is also supported by the data: IT intensity increases reporting frequency ( $\eta^2=0.0978$ ). Intensive use of IT has a positive effect (of a medium

Table 3

Mean values by company group and strength of association calculated between independent and dependent variables

MC tools in use									
	Mean values by groups			Sum of squares				Eta-squared	Effect size
	Non-users	Beginners	Intensive users	Between Groups	Within Groups	Total	Sig of F-test statistics		
Reporting frequency	1,4157	1,8217	2,3116	11,1966	103,6448	114,8414	0,0004	<b>0,0975</b>	Medium
External focus	0,1667	0,2760	0,4417	1,1441	9,8612	11,0053	0,0024	<b>0,1040</b>	Medium
Non-financial info	0,4222	0,4367	0,6326	1,0992	9,2320	10,3312	0,0021	<b>0,1064</b>	Medium
Future orientation	0,3965	0,5687	0,7019	1,9223	8,4615	10,3838	0,0000	<b>0,1851</b>	Large-medium
IT Intensity									
	Mean values by groups			Sum of squares				Eta-squared	Effect size
	Non-users	Beginners	Intensive users	Between Groups	Within Groups	Total	Sig of F-test statistics		
Reporting frequency	1,4946	1,8738	2,3660	7,7455	71,4542	79,1997	0,0055	<b>0,0978</b>	Medium
External focus	0,4454	0,2605	0,3426	0,4412	7,5523	7,9935	0,1672	-	No sig. effect
Non-financial info	0,6724	0,4479	0,4626	0,2272	6,4483	6,6755	0,3359	-	No sig. effect
Future orientation	0,3989	0,6068	0,6312	0,7947	5,5293	6,3240	0,0031	<b>0,1257</b>	Medium

Although intensively criticized, Cohen's interpretive framework is very helpful for evaluating the values of eta-squared (Vacha-Haase – Thompson, 2004). Invoking Cohen's  $d$  benchmarks recalculated for eta-squared (small  $\sim 0.01$ ; medium  $\sim 0.1$ ; large  $\sim 0.25$ ) indicates that all significant relationships are at least of medium strength.

The above reported eta-squared calculations follow the logic of  $R^2$  (measuring model fit in regression models). Unlike  $R^2$ , eta-squared is sensitive not only to linear relationships, but also to nonlinear ones (Vacha-Haase – Thompson, 2004). It indicates the proportion of variation in the dependent variable that is attributable to differences among the means of the groups; i.e., the effect of independent variables. Consequently, a significant value for eta-squared indicates not only that there is a significant association between the vari-

size) on future orientation ( $\eta^2=0.1257$ ), but does not affect the provision of non-financial and externally focused information. Accordingly,  $H_{2a}$  must be rejected.

Figure 4 visualizes the rejected and verified relationships for items of management control system design and IT intensity.

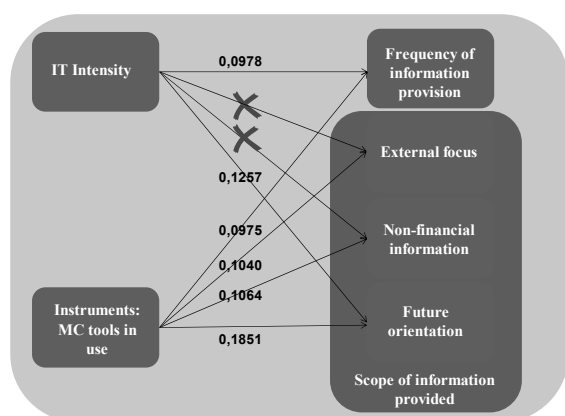
Are the relationships between these variables valid? Or are they influenced by other factors not considered in the research model? Analysing relationships – whether correlational or causal – requires addressing a very important issue: the third variable problem. A third variable (often called a control variable, test variable, confounding variable or hidden factor) causes a spurious relationship that is merely statistical and may not actually be observed.

Previous studies have shown that the management control systems of Hungarian companies are



significantly affected by company size and by foreign ownership. In order to avoid explaining spurious relationships, *company size* (expressed as number of employees) and *ownership variables* were used as control variables.

Figure 4  
Rejected and verified relationships among items of MCS design and IT intensity



Three groups of companies of different size were established (1=50-99 FTEs, 2=100-249 FTEs and 3 $\geq$ 250 FTEs) and a chi-square test was performed to crosstabulate the categorical independent and categorical control variables. At a significance level of 5%, company size and IT intensity are not significantly related to each other ( $p=0.078$ ). Although companies with over 250 FTEs (group 3) clearly use IT tools more intensively, this tendency is not reflected in the mean values of group 1 and 2. Similarly, company size and intensity of use of advanced MC tools are not significantly correlated to each other ( $p=0.187$ ). It is worth noting that company size influences the total number of MC tools in use, but the effect is not significant for advanced tools. The same test for ownership categories (1= Hungarian state, 2= Hungarian private, 3=Foreign owner) found no significant correlations between ownership and independent variables.

Controlling for the dependent variables, the distribution of the information-related variables was studied by company size and ownership form. Two significant relationships were found for which eta-squared was calculated. Bigger companies issue reports more frequently (0.0653,  $p=0.002$ ) and tend to be more future-oriented (0.0422,  $p=0.035$ ). Company size and other aspects of MCS design are unrelated; ownership is not significantly correlated with any of the dependent variables.

As control variables are not systematically related to the variables in question, the confounding effect of

control variables on the analysed relationships can be excluded.

#### Discussion of results in focus group sessions

Following the statistical analysis, results were presented to senior controllers in group discussions which focused on addressing two main questions. Why is having a future orientation more strongly correlated to intensity of tool use than other aspects of MCS, and why does increased IT intensity not support the provision of non-financial and externally focused information?

While ERP is able to support the provision of internal financial information, later developments in IT may enable companies to process a broader scope of data. This development is more typical of bigger companies, while the mid-size companies under analysis remain more engaged in establishing or developing their basic transactional systems. Add-on systems are rarely employed, a fact which is reflected in the low IT intensity of the sample firms. One application (out of the 14 listed) is used on average by only 22.8% of companies.

Mid-size companies still do not have IT systems that systematically collect and process non-financial and externally focused information. This type of information is typically manually collected and analysed in an ad-hoc way through campaigns. The other reason for manual processing is that the required non-financial and external information is much more company-specific than financial information. Automatic processing of this information would require (in many cases) customized developments; 'off the shelf' systems are less able to fulfil these needs.

Surprisingly, the association between IT intensity and reporting frequency is the weakest among all significant relationships. Assuming that IT automates data processing and enables easy data access, a much stronger effect on reporting frequency was predicted.

The variable in the model measured IT intensity by the weighted average of IT applications in use. With respect to reporting frequency and quality, another feature of IT systems also appears to be relevant: the level of integration between the implemented IT solutions. As one of the participants of the focus group session stated: "The most substantial value in our company is found in data correspondence. ... One of the business units gives a number to our CEO that is derived from their own system. Of course, the systems do not communicate with each other... Controllers have their own numbers and if the numbers do not match, then the number of the controllers is wrong."

The 'one number policy' requires the integration of the underlying systems, which not only relates to the question of how effective reporting is, but more im-

portantly, significantly affects data quality, and consequently, use of the MC information.

Among the three characteristics of broad scope information, future orientation is most supported by the intensive use of tools. Future orientation was operationalized by a variable that measured how extensively firms use pre-calculations and prepare plans and budgets for different areas of corporate functioning. This variable better measures the technical process (the existence of budgeted numbers) than the quality of forward looking. However, as IT solutions enable better planning and budgeting processes, extensive budget preparations are likely to be supported.

The effect of MC instruments on the provision of non-financial and externally oriented information is weaker than its effect on future orientation. This can be rationalized by pointing to the fact that it is still more common for business units to collect and maintain these types of information than controllers. Even if this information finally appears in MC reports, customer satisfaction (for example) is often measured, collected and monitored by the sales department, information about price fluctuations in raw materials by procurement, and analyses of competitors' activities by the production department, etc.

## Conclusions

Several studies have investigated the adoption rates of management control practices. Researchers have concluded that firms use a mix of traditional and new tools, and the results of this research have also verified the fact that traditional tools have not disappeared. Classical tools that rely on financial measures (such as product profitability analyses) are likely to remain important in the future as well. As the CIMA report (based on input from over 400 respondents) states: *"It suggests that the discipline has a solid foundation, and principles which endure yet are refined so that the body of knowledge is continually expanding"* (CIMA, 2009, p. 28.).

Researchers are willingly reporting that increasing emphasis is being placed on the use of newer tools alongside traditional ones (J. Hyvönen, 2005), because older, simpler techniques might not be satisfactory any more (Tirnitz, 2010). Interestingly, our data does not support this claim. Compared to the previous survey (conducted in 2009), the rates of use of MC tools are very similar both for traditional and advanced practices. Use of the file-closer Balanced Scorecard has even dropped in popularity (from 22.1% to 16.9%). The similar decline in adoption rates at the end of the 1990s was rationalized by Dankó and Kiss (2006) as the learning effect of Hungarian companies.

Both MC and IT tools were applied as independent factors to explain the frequency and nature of the information provided. In line with the previous studies on the interplay between IT and MCS, the strength of association was found to be limited. The main rationale behind this is that the research had its focus on mid-size companies, which are still wrestling with effective processing and providing internal financial information to managers.

Intensive use of advanced MC tools has a moderate effect on all information-related aspects of MCS: companies well equipped with advanced tools are more likely to be better at providing broad scope information. One might well ask, why was only a moderate level of association proved? The author believes that it is nearly impossible to incorporate all the potential sources of influence into such a study, even if they might have an effect on the dependent construct. Besides the external contingencies often investigated, I would like to stress one very important internal factor of influence: the managers themselves. What do they want to be reported and how often do they want it reported? If no need emerges to frequently report externally focused, non-financial information, controllers will not report it, even if they have a toolkit at hand.

Chenhall (2003), the author of numerous contingency studies on MC, drew attention to the problematic of researching outcome-related variables related to the characteristics of MCS such as information provided, or tools in use. Organisational members, and even entire organisations such as subsidiaries, may be forced to use certain MC tools and to provide certain information, even though they find it of little use.

Besides measuring the frequency of tool use, actual utility (i.e. the benefits that are derived from the adoption of specific tools) could be the subject of further analysis. Reported benefits may comment on future emphasis being placed on a certain MC tool / information. High adoption rates and low ranking of benefits may indicate that a tool is becoming outdated, or was not able to meet the expectations of users (Joshi, 2001; CIMA, 2009).

However, research only into the adoption rates of tools and the information they provide is not useless. As Gerdin (2005) has stated: *"It is logical to describe the MASs (Management Accounting Systems) in terms of what is actually supplied to managers. After all, only information that is available can help managers to achieve organizational goals"* (Gerdin, 2005, p. 113.).

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