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Chapter 13

Green Controlling Methods in Hungarian Corporate Practices

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Climate change is one of the most pressing issues of our time. The ongoing ecological crises – pollution of the atmosphere, soil, biodiversity and water – are a major concern for the long-term viability of the natural environment. The task of economists, both at macro and micro level, is to take a multidisciplinary approach to the interplay between economic and environmental considerations, as environmental aspects must be taken into account when economic decisions are made. Companies' decision-making mechanisms are affected by the growing environmental demands of different stakeholder groups. These include, for example, consumers, credit institutions, the state and municipalities, local communities, the parent company, owners, through legislation and regulations. One of the main objectives of environmental controlling is to integrate economics and environmental sciences in its management decision support function and to support the cooperation of professionals working in the fields of economics and environmental protection at the organisational level. This will ensure the flow of information between separate disciplines and management and examine the economic mapping of environmental activities.

The research is structured in the following parts: in the first part, the authors describe controlling in the German literature as a method to support corporate governance – known in the Anglo-Saxon literature as management accounting – and its environmental extension, but only briefly describe the environmental controlling toolkit. The literature review will provide knowledge about controlling, including green controlling, its concept and tools. The next two sections present the main research question, the related hypotheses and the research sample. In order to facilitate the interpretation of the results, the description of the numerous control tools examined will be presented in the 'Results', in parallel with the analysis of the practical application of each tool in Hungarian companies. The research results are summarised in the 'Conclusions', which also includes the limitations of the research.

13.1. Controlling – Green Controlling and Its Tools

Controlling is a management tool that helps management to adapt to dynamic changes in the environment, a system of planning, accountability, information, control and stakeholder management. The controlling system is one of the main subsystems of the management system of an organisation, which among the functions of management, undertakes strategic and operational planning, supervises the implementation of plans, monitors and compares plan and actual data, and analyses discrepancies. These tasks are coordinated and regulated by its own organisation and information system (Körmendi & Tóth, 2011).

The two branches of controlling literature are the German and the Anglo--Saxon trends. According to the continental (German) school of thought, controlling is a management tool, while the Anglo-Saxon literature considers it a part of management. Due to our economic embeddedness, the development of controlling in Hungary has tended to move towards the German trend, but as Hanyecz (2011) notes, development is moving towards a combination of the two; they are compatible because the key is result orientation. As defined by Professor Péter Horváth (2015), who played a major role in the development of German and Hungarian controlling: *controlling is a cross-functional management tool whose task is to coordinate planning, control and information supply in order to ensure that the company achieves its profit target* (Horváth, 2015).

In the literature on corporate control systems that include environmental protection, a number of different terms are used in both German and Anglo--Saxon literature. In the present research, the authors have used the terms 'environmental management accounting' and 'green controlling', which are most appropriate for the research objectives.

The term 'environmental controlling' means the application of controlling approaches to corporate sustainability management (Schäffer & Jais, 2005).

A balanced relationship between the objectives of the three dimensions of sustainability (economic, social and environmental) is important (Horváth, Isensee, & Michel, 2012). The role of sustainability controlling is to provide extensive support to sustainability management (Bedenik, Prebežac, Strugar, & Barišić, 2019) in the formulation of sustainability goals and the development of corporate policies covering all three dimensions (Păunică & Mocanu, 2017). Environmental controlling focuses primarily on ecological aspects but does not ignore other dimensions (Gould, 2011; Tschandl, 2012).

Environmental controlling can be understood as a management function alongside other functional controlling tasks. Environmental controlling, and its role of supporting and coordinating the system of environmental management, can be defined as a subsystem of controlling which, through its system-building and coordinating function, adds ecological components to the planning, management, control and information supply functions of controlling, thus supporting the adaptive and coordinating capacity of the whole system (Fassbender-Wynands, Seuring, & Nissen, 2009). It is important that the environmental management system is not developed as a separate, isolated solution but as an integral part of the overall corporate information and communication system. Chapters 2 and 8 of this monograph also mention the need to include management accounting expertise in ESG reporting and management decision support. The importance of this is also reflected in the fact that environmental considerations can influence the economic success of companies and it is therefore recommended to integrate environmental factors into the management and planning systems of companies (E. Günther, T. Günther, & Endrikat, 2018).

The tools that can be used can be grouped in different ways, according to the level of application (strategic or operational), the areas of application. Laine, Tregidga and Unerman (2021) mention the following: material flow cost accounting, life-cycle assessment, social return on investment (SROI), sustainable investment appraisal, key performance indicators (KPIs), cost accounting and allocation, but the list can be extended with, e.g., Ecological footprints, sustainability balanced scorecard, water management ac-counting. In addition to the above, Tschandl (2012) highlights the following tools of green controlling: ABC analysis, scenario analysis, risk management, technology analysis, product line analysis, portfolio analysis, material and energy balances, environmental cost budgeting.

13.2. Research Question and Hypotheses

There are several terms used in the literature for corporate control systems that cover environmental protection. The definitions use elements of the traditional concept of controlling, whereby environmental controlling is defined as a subsystem of corporate management. This subsystem systematically coordinates plan-

ning, monitoring and the provision of environmental information. In its management decision support function, it helps to develop and integrate environmental objectives into the corporate target system. Develop a system of relevant indicators to measure the achievement of objectives and carry out planactual comparisons. In practice, it is the implementation of strategic and operational control in environmental management, primarily an information system for the collection, evaluation and decision-oriented preparation of ecological information.

The aim of the authors is to conduct an empirical research on the environmental activities, controlling tools and methods adopted or applied by the 5,000 largest companies (headquartered or located in Hungary) based on the number of employees. They formulated their research question as follows.

Q: Can the research sample show that companies operating in Hungary have incorporated specific environmental goals and tools into their strategies and operations?

Their assumptions in this regard are:

H1: The group of companies under review has set environmental targets for environ-mental objectives, which it incorporates into its strategic objectives.

H2: The companies surveyed use the methods of the available controlling toolbox to varying degrees to develop their environmental strategies and monitor their implementation.

The following is an empirical examination of the above research question and two related hypotheses.

13.3. Data and Methodology

In order to answer the research question, an empirical study using a questionnaire survey was conducted. The 5,000 largest enterprises operating in Hungary (with a registered office or a place of business) were selected as the database based on the number of employees. Their online questionnaire was successfully sent to 4,606 addresses, with 205 questionnaires returned, of which 121 were completed (answering the mandatory questions). The number of variables surveyed was 173. Most of the companies in the sample from Pest, Somogy, Baranya, Csongrád--Csanád and Veszprém counties completed the questionnaire. In contrast, the least willingness to fill in the questionnaire was in Nógrád county, where only one company returned a completed questionnaire. Table 13.1 shows the distribution of the companies in the sample by economic sector/industry.

By economic sector/industry, 38.05% of the surveyed enterprises are employed in manufacturing, 10.73% in water supply, sewerage, waste management, 8.78% in agriculture, forestry and fishing, and the remaining enterprises are distributed in a lower percentage between the areas.

Table 13.1. Distribution of the research sample by industry

Economic sector	Frequency	Share (%)
A = agriculture, forestry, fishing	18	8.78
B = mining, quarrying	2	0.98
C = manufacturing industry	78	38.05
D = electricity, gas, heat, air conditioning	7	3.41
E = water supply, wastewater collection, treatment, waste management, decontamination	22	10.73
F = construction industry	9	4.39
G = trade, motor vehicle repair	14	6.83
H = transport, storage	14	6.83
I = accommodation and food service activities	3	1.46
J = information, communication	5	2.44
K = financial, insurance activity	3	1.46
L = real estate transactions	2	0.98
M = professional, scientific, technical activity	10	4.88
N = administrative and support service activities	12	5.85
O = public administration, defence, compulsory social security	1	0.49
Q = human health, social care	2	0.98
R = arts, entertainment, leisure	3	1.46
In total:	205	100

Source: own presentation.

Overall, the structure of the questionnaire examined companies with the highest occupancy data in five sections: 1) general environmental practices; 2) environmental aspects and control; 3) environmental objectives; 4) organisation and environment; and 5) general company data. In the following, the chapter presents some of the results of the questions on the general environmental practices of the companies surveyed and the controlling tools used.

13.4. Research Results

For the database of the 5,000 companies with the largest number of employees in Hungary, it is a good result that 83.4% of the companies that filled in the questionnaire stated that they have a substantial environmental protection activity. However, it is noteworthy that only 31.2% of them produce transparent and regular reports on environmental protection processes. Exactly the same proportion plan environmental initiatives, measure and evaluate their implementation. 69.8% of companies said that they have integrated environmental considerations into their corporate governance processes. The results show that

environmental controlling has a lot of scope and work to do, as almost 70% of companies have environmental protection as an integral part of their corporate governance, but only slightly more than 30% report on the issue and review the achievement of environmental objectives.

In this area, the need for controlling to more effectively implement a system of environmental indicators into business as an extension of controlling activities and areas is apparent. The demand from businesses should also be investigated, as the application of new reports, statements, indicators and their regular monitoring is a labour-intensive and time-consuming process, which also entails costs. The introduction of environmental controlling systems and indicators, as well as the monitoring and communication of other sustainability elements, should also consider the demand from stakeholders, e.g., environmentally conscious consumers, credit institutions, and public authorities. Short-term and long-term effects, and costs and benefits of sustainability reporting are discussed in chapter 3 of this monograph, and the relationship between sustainability reporting and sustainability performance is discussed in chapter 9. Companies that report and examine the achievement of the targets can serve as a model, a best practice, and a benchmark for companies less familiar with this area (Figure 13.1).

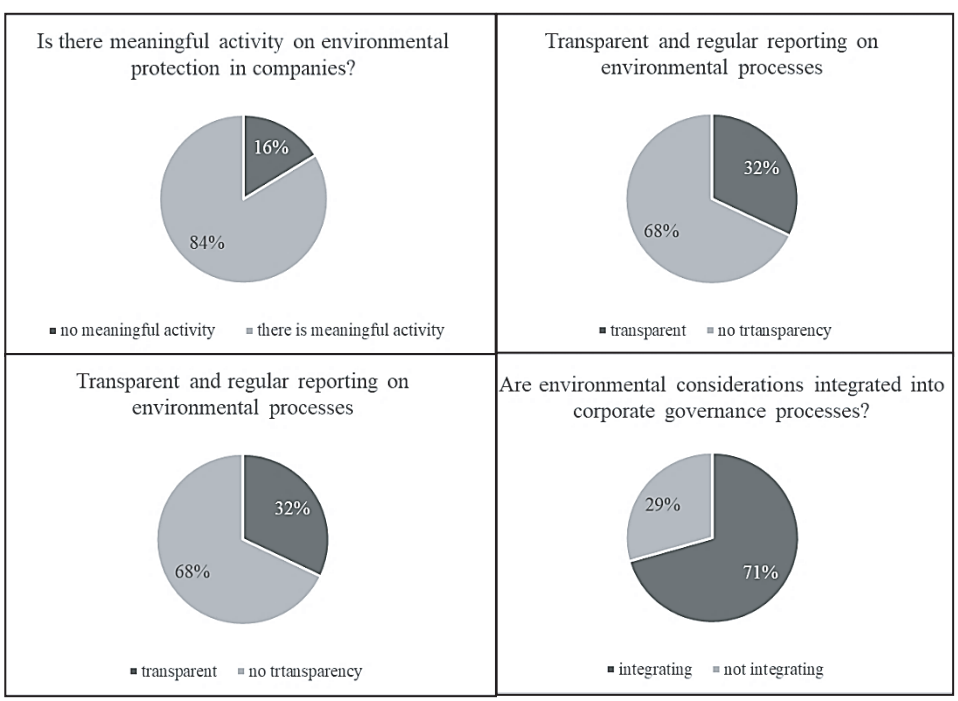

Figure 13.1. General environmental practices among respondents (number, %)

Source: own presentation.

Regarding the use of controlling tools, the respondents were surveyed in terms of using 21 methods. The methods were grouped into four main categories: strategic issues, administrative issues, methodological issues and economic issues. Table 13.2 shows the number and percentage of respondents using controlling tools from each category.

Table 13.2. The controlling tools used in the examined sample

Controlling tools	Number	Share (%)
1. Strategic issues		
Development and integration of environmental objectives into the strategy	112	75
Written environmental policy	98	66
Environmental training programme for employees	67	45
2. Administrative issues		
Conducting internal environmental audits	114	77
Conducting external environmental audits	81	54
Public environmental report	42	28
3. Methodological issues		
Developing and using environmental indicators	79	53
SWOT analysis	72	48
Identifying environmental success factors (KPIs, key performance indicators)	60	40
Benchmarking environmental performance	31	21
Scenario techniques	26	17
Eco-balances	24	16
Sustainability Balanced Scorecard	14	9
4. Economic issues		
Evaluation of investments (integrating economic and environmental evaluation)	90	60
Planning, recording and assessing environmental costs	89	60
Planning, recording and evaluating revenues from environmental protection	86	58
Examining the economics of environmental strategies	83	56
Including environmental costs in the pricing of products/services	82	55
Evaluation of environmentally friendly product alternatives	66	44
Assessing the life cycle costs of products (from innovation to disposal)	46	31
Environmental criteria used to assess and/or reward employees	30	20

Source: own presentation.

The results show that one factor each for strategic and administrative issues is the most widely used instrument. The companies surveyed are most likely to conduct internal environmental audits (77%) and develop and integrate environmental objectives into their strategy (75%). After strategic and administrative issues, the factors listed under economic issues are the most commonly used controlling tools in the surveyed companies. Of these, the evaluation of investments, which integrates economic and environmental evaluation and the planning, recording and evaluation of environmental costs are both included with 60%. Environmental costs can include, for example, the costs of preventing and reducing environmental damage, the costs of disposing and controlling the waste generated, and the costs of restoring the damage caused (Jasch, 2003). The planning, recording and evaluation of revenues from environmental protection are among the controlling tools used in the sample, with a similar proportion of 58% as costs. Environmental revenues can come, for example, from subsidies received or waste sold. Their magnitude depends on the industry, but they are obviously a fraction of the costs in the base case. Environmental cost accounting can not only identify cost reduction opportunities but also allow more specific pricing (Ván, 2014).

A related factor in this research is incorporating environmental costs into the pricing of goods and services, with 55% of the sample used. Another cost-related factor under consideration is the assessment of the life-cycle costs of products, which looks not only at the cost implications of the phase of the life-cycle during which the product is on the market but also at the phase before (e.g., innovation, development, market introduction) and after (e.g., restoration of the natural environment, servicing, take-back obligations).

This can be done through the use of life-cycle costing, which avoids the shortcoming of traditional costing systems of comparing the revenues and costs of a period (usually one year). This is because they are typically only related to the market stage, so they include only production costs and allocable overheads, and the problem of allocating the aforementioned upstream (pre-market) and downstream (post-market) costs to products is not solved. In the study sample, life-cycle costing was found in 31% of the study sample. An important task for the practical implementation of the controlling sciences is to facilitate and disseminate the use of the extended life cycle approach and the related life cycle costing in companies.

Figure 13.2 shows a grouping of the methods used in each category within the scope of the surveyed companies (coded according to Table 13.2). It clearly indicates that after carrying out internal environmental audits, which is an administrative issue, and two strategic issues (developing and integrating environmental objectives into the strategy and a written environmental policy), there is a significant range of economic methods.

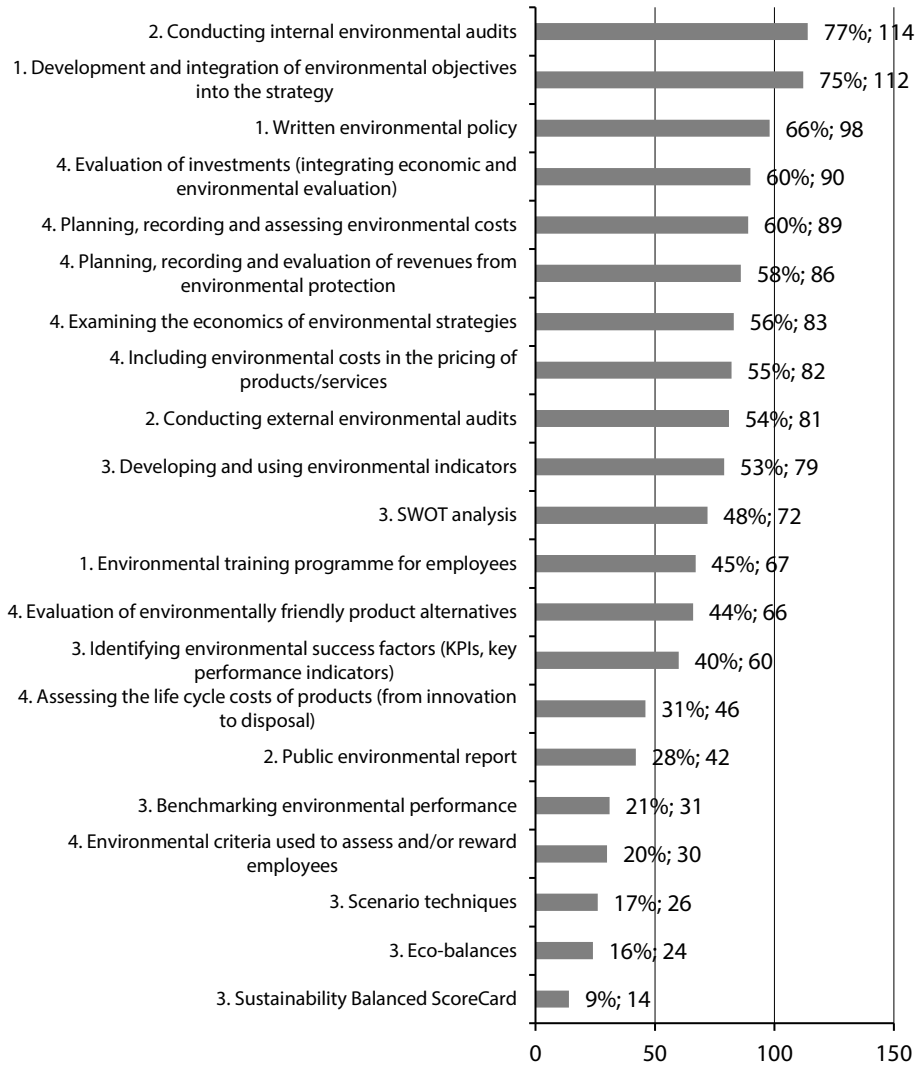

Figure 13.2. Application of the tested controlling tools in the sample

Source: own presentation.

Of the methodological factors, the development and use of environmental indicators are the most common among the companies surveyed (53%). A number of recommendations for environmental indicators can be found in the literature, including economic ones, such as the EPA model, the Schalltegger-Burritt model, the UNDSD model, and the IFAC model (Szauter & Madarasiné Szirmai, 2018). The use of SWOT analysis, one of the best-known tools for strategic analysis, is 48% for

the environment in the sample surveyed. The ultimate purpose of a SWOT analysis is not simply to list (and in some cases weight) the internal strengths, weaknesses, opportunities and threats of the external environment but to provide a starting point for strategy development.

The use of environmental KPIs (key performance indicators) is 40% in the sample. KPIs show how an activity can be successful and how a business can be greener. So they are measurable indicators created to measure the achievement of strategic objectives. They are needed to describe a complete system to help manage, coordinate and communicate the link between sustainability and financial performance, with an emphasis on compression and transparency. ISO standards (e.g., the ISO 14000 family of standards) can help in the development of environmental KPIs. Examples of environmental KPIs include CO_2 emissions, gas and electricity consumption levels, waste and recycled waste rates, plastics and biodegradable materials rates, company fleet mileage, reusable products as a percentage of total products, and targets and commitments related to environmental standards (Bagó, 2019). Rackow et al. (2013) defines energy consumption as the most important KPI, the main task of green controlling is to create transparency by visualising the company's energy flow along the production processes, which includes energy consumption as the fourth main target dimension in corporate controlling, along with time, cost and quality.

Environmental performance benchmarking is used by 21% of the companies surveyed. Benchmarking most often focuses on an element of a company's performance, comparing it within a company or between companies. Through it, information from other units' processes and management techniques can be accessed to develop improvements. The development of organisational strategy is a central element of continuous improvement, organisational learning, and a tool for finding best practices (Trujillo-Gallego, Sarache, & Sellitto, 2020).

17% of respondents use scenario techniques, which is quite low. Scenarios are possible future states, and scenario analysis is an analytical tool used before developing strategies. Because of the expected social and economic impacts, organisations are advised to monitor existing climate change scenarios and environmental scenarios from various institutions and consultants on global and national climate change (e.g., the UN Intergovernmental Panel on Climate Change regularly publishes assessment reports for scenarios) (Intergovernmental Panel on Climate Change [IPCC], 2021). These often include risk models and economic forecasts. Adverse changes related to climate change are also expected or are already being felt in Hungary, such as an increase in the frequency of extreme weather events, a rise in mean temperature, an increase in the number of hot summer days, cold snaps in spring, adverse changes in the amount and distribution of precipitation, and a decrease in biodiversity. There are several possible future pathways of socio-economic change in which the preparedness and climate adaptation capacity of farming organisations are key elements. Besides changes

in natural factors, the different scenarios are also influenced by, e.g., emission reduction agreements (Szépszó & Lakatos, 2017).

Organisations need to adapt, both to the specific changes affecting their work and to Community and national commitments. Adaptation requires organisations to assess the most relevant climate risks they face, which can be categorised as physical and adaptation risks (Network for Greening the Financial System [NGFS], 2019). Physical risks include loss due to climate change events (e.g., severe weather events, disasters). Transition risks include the impacts of measures taken to reduce greenhouse gas emissions and put the economy on a carbon-neutral path. Transition risks may arise due to technological shocks (e.g., market penetration of cleaner technologies) and/or economic policy shocks (e.g., discretionary measures, see carbon tax), and in the longer term, technological, policy, regulatory and social shocks and processes of transition to a carbon neutral economy must also be taken into account (Boros, 2020). The scenario analysis should take into account both company and sector-specific physical and transition risks.

The take-up of eco-balances is also relatively low, at 16% of respondents. An eco-balance sheet is a management accounting tool that helps organisations to demonstrate the potential environmental and financial consequences of their material and energy use practices, thereby providing an opportunity to improve the environmental and financial consequences by changing existing practices. It collects information on physical and monetary assets and the accounting of energy flows to reflect the short-term impacts on the environment of products, sites, departments and companies. Its disadvantage is that it focuses on short--term, past, routine information gathering (Burritt, Christ, & Schaltegger, 2021). An eco-balance is often an input-output balance, contrasting the material and energy inputs of a company with its material and energy outputs, which can be products, materials and energy emissions.

The use of the Sustainability Balanced Scorecard (SBSC) is the lowest in the surveyed companies at 9%. This is unfortunate because the Balanced Scorecard (BSC) is effectively a set of strategically important targets and indicators, expectations of the values of the indicators, and actions to be taken to achieve the targets (Figure 13.3). All this is integrated into systems built around learning and development, operational processes, and customer and financial perspectives, with the cause-and-effect relationships between indicators culminating in financial performance. The development and use of environmental indicators was 53% of respondents.

From a methodological point of view, the main question is how to integrate sustainability aspects into the traditional BSC. Based on the literature, there are several options for doing so (Abdelrazek, 2019; Al-Zwyalif, 2017; Hansen & Schaltegger, 2016; Szóka, 2022).

- Integrating environmental (and social) considerations into the four perspectives: this approach makes environmental and sustainability considerations an

integral part of the traditional BSC and integrates them into the chain of cause and effect.

- Expanding the BSC to include a further perspective on sustainability issues: in the approach of Kaplan and Norton (the BSC developers), the BSC is a company-specific system and thus may involve adding or renaming a perspective. The standard BSC perspectives only reflect the market system; adding a fifth – environmental – perspective to the BSC is justified if the company's strategy includes environmental aspects outside the market system.
- Developing a separate environmental scorecard: the design and implementation of a specific EBSC (Environmental Balanced ScoreCard) cannot be independent of the traditional BSC. The EBSC used by the environmental unit of the company should be linked to the traditional BSC to help the organisation achieve good results in relation to the environmental management system. Presenting the environmental strategy from all four perspectives can help to improve the system (Hockerts, 2001), illustrating the links between the elements of environmental performance and the strategic and financial objectives of the organisation (Johnson, 1998). Chapter 7 also deals with the incorporation of ESG aspects into the Balanced Scorecard, in the context of large cities – this shows the wide applicability of the method.

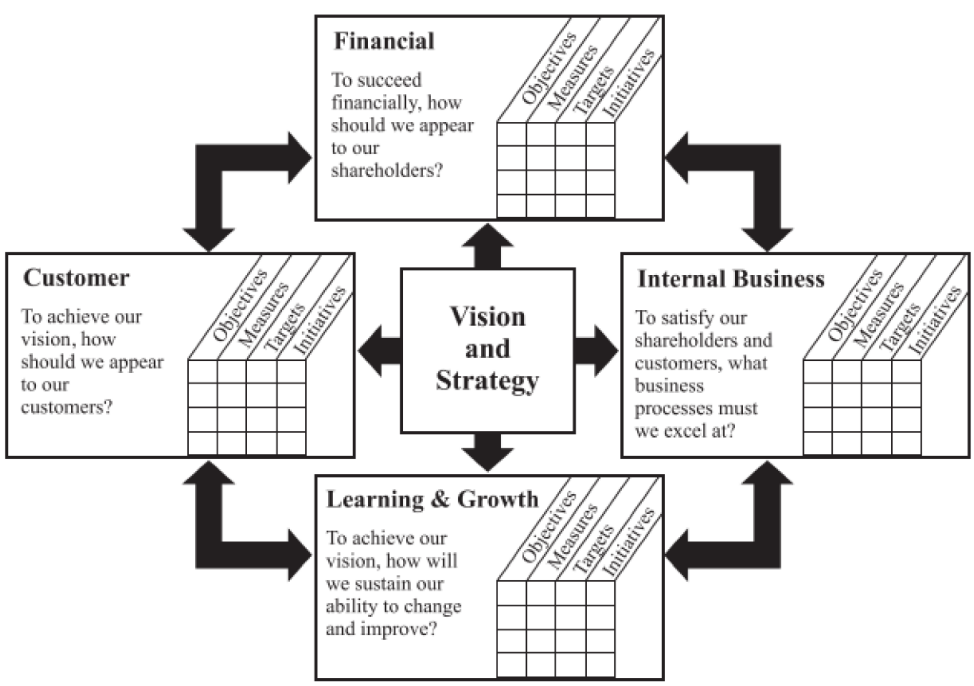

Figure 13.3. The conceptual scheme of the Balanced Scorecard

Source: (Kaplan & Norton, 1998).

The nature of the environmental challenges, risks and their social and economic drivers requires each company to build an environmental management system tailored to its specificities. Each of them operates in a different sector, in a different technological environment, with a different set of objectives and activities, and therefore faces specific environmental costs and benefits. They produce different products and have different processes which require different methods. The technology they use determines their raw material and energy consumption, production methods and efficiency, product performance, waste reduction and management. This leads to the conclusion that, although common standards may apply to companies, the methodology and best practice they can rely on is not uniform.

Decisions related to green controlling and environmental protection are not part of the general controlling system of the sampled companies, as the environmental product is typically the responsibility of different units within the company. In their empirical research, ten areas were examined: senior management; business (finance, accounting, controlling); health, safety, environment; manufacturing/operations; communications; marketing/sales; procurement; product development; human resources and others. The results show that environmental issues are largely the responsibility of senior management (57%), with a high percentage of the top management (45%) also being responsible for health, safety and the environment. In addition, production/operations (30%) and communication (16%) are also typically identified as the unit responsible for the topic.

13.5. Conclusions

In the research on general environmental practice, it was found out that almost 70% of the companies surveyed have environmental protection as an integral part of their corporate governance, but only slightly more than 30% of them produce transparent reports on the subject, plan and measure the achievement of environmental objectives.

The analysis of the application of the control tools used was divided into four parts: strategic, administrative, methodological, and economic. It was found out that the use of an administrative factor (carrying out internal environmental audits) is the most common (77%), with the exception of strategic and economic tools. These include the development and integration of environmental objectives into strategy (75%); the integration of economic and environmental assessment into investment appraisal (65%); the planning and recording of environmental costs (60%) and revenues (58%); the assessment of the economic viability of environmental strategies (56%); and the integration of environmental costs into the pricing of products and services (55%).

The most common methodological tools are the development and use of environmental indicators (53%) and SWOT analysis (48%). In examining the methodological tools, it can be concluded that there are neglected tools that could be used to increase the use of environmental management systems. These include environmental performance benchmarking (21%), identifying existing good practices and best practices and implementing relevant elements. The use of scenario techniques (17%) can be an important tool for adapting to change by preparing scenarios in anticipation of possible outcomes of relevant physical and transition risks. The use of a sustainability or environmental Balanced Scorecard (9%) can contribute to the use of existing environmental indicators in a system (53% of respondents said they use Them) and to the identification of relevant links between targets and indicators. To show the contribution and impact of environmental objectives on the company's learning and development factors, operational processes, customer-related factors and ultimately on the financial results.

Based on the results of the research, it can be concluded that the nature of the environmental challenges, risks and their social and economic drivers requires companies to develop their own green controlling systems, which can be similar to those used by other companies, but each company should take into account its own specificities. A similar conclusion was reached regarding the motivation to establish an environmental control system. Based on the empirical analysis, it was found that the companies surveyed gave a wide range of responses in terms of motivation. It is typical that achieving legal compliance, reducing environmental risks, preventing pollution and identifying future obligations are the most important for them. Of course, this will be accompanied by information on operations, as well as image and visual improvement. Based on the analysis of the research results, the hypotheses of the paper are accepted.

The main limitation of the survey is that the questionnaire sent to the 5,000 Hungarian-based enterprises with the largest number of employees resulted in a relatively low response rate (4.45%). No representativeness check was carried out on the returned questionnaires. A further limitation is that the classification of the 21 controlling methods into the four main groups (strategic tools, administrative questions, methodological questions, economic questions) was based on the authors' own judgement on the basis of the characteristics of each tool as defined in the literature.

Overall, on the basis of the research sample, it can be concluded that companies operating in Hungary have incorporated specific environmental objectives and tools into their strategies and operations. As a thesis, it can be formulated that the group of companies studied follow defined environmental objectives in terms of environmental targets, which they have integrated into their strategic objectives. In order to develop their strategies for environmental

protection and to monitor their implementation, the methods of the available monitoring toolbox were used to varying degrees, according to the responses to the questionnaire.

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