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Corporate sustainability accounting information systems: a contingency-based approach

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Abstract

Purpose – This paper aims to explore the development of sustainability accounting information systems through lens of contingency theory. In this digital age when companies are confronted with massive sets of data, integration of financial and non-financial data, little empirical evidence exists on how sustainability issues are integrated or linked within internal corporate information systems.

Design/methodology/approach – A questionnaire-based survey, hypothesis testing, principal component methods and hierarchical clustering are used to provide original empirical evidence from major Lithuanian companies.

Findings – The main findings reveal that most companies surveyed include a sustainability strategy in their core strategy, but there is a lack of linkage with measuring and integrating sustainability outcomes within the entirety of corporate financial results. Unexpectedly, the association between stakeholders' involvement and sustainability accounting information system design was not as strong as hypothesized theoretically. Therefore, it deserves further investigation, constituting an important implication for future research. Specifically, three profiles of sustainability accounting information systems were explained, namely, integrated, fragmented and compliance systems.

Research limitations/implications – The limitations of this study relate to the small sample size, as sustainability-related information is still regarded quite confidential.

Practical implications – This result could serve as a specific reference for companies to apply integrated sustainability accounting information systems that might serve as a good practice model for companies, however, fragmented and compliance profiles are the prevailing ones.

Social implications – The findings are important for fostering corporate social responsibility by developing sustainability accounting information systems.

Originality/value – This paper contributes to the sustainability accounting and information systems literature by providing empirical evidence linking contingent factors with the development of sustainability accounting information systems.

Keywords Strategy, Information systems, Contingent factors, Sustainability accounting, Principal component methods

Paper type Research paper

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1. Introduction

Sustainability concepts have dramatically widened the scope of business models to be in line with a more pluralist approach, which takes stakeholders, corporate social responsibility, environmentalism and transparency into account. While sustainability accounting and reporting have been popular research topics over the past 20 years, a focus on corporate accountability settings (Bebbington *et al.*, 2017) is still necessary to address sustainable development issues. Companies have difficulties adressing the "sustainability agenda" (Mäkelä *et al.*, 2017), and major organizations struggle with sustainability reporting. A KPMG survey (2017) shows that more than 90 per cent of the world's 250 largest companies release sustainability reports, while only 43 per cent of these reporters link corporate responsibility activity to the UN Sustainable Development Goals (SDGs). Currently, globally recognized but legally non-binding methodologies for corporate accountability are applied with the aim to improve companies' abilities to prepare sustainability reports. However, there is no sign of a consensus on a global reporting standard, and the competing frameworks are quite complex. Furthermore, an impressive volume of research has focused on examining various research issues of sustainability accounting and reporting from the external point of view (Fortanier *et al.*, 2011; Bebbington *et al.*, 2009; Odera *et al.*, 2016; Shabana *et al.*, 2017), exploring narratives on how sustainability accounting might advance (Gray *et al.*, 2003; Gray, 2010) at the country level (Bebbington *et al.*, 2012; Higgins *et al.*, 2015; Chauvey *et al.*, 2015); sector level (de Villiers *et al.*, 2014; Talbot and Boiral, 2018); public level (Adams *et al.*, 2014); and integrated reporting (Dumay *et al.*, 2016; Eccles and Krzus, 2010; Simnett and Huggins, 2015).

While the patterns of external sustainability reporting are well-known worldwide, considerably less is known about the development of corporate sustainability accounting from the contingency perspective, particularly how companies integrate sustainability issues into their information systems (Maas *et al.*, 2016; Schaltegger and Hörisch, 2017; Gond *et al.*, 2012). However, Soderstrom *et al.* (2017) argue that during several years a major change in research took place concerning the integration of sustainability in management control systems. However, there is still ongoing debate and scant empirical evidence on how sustainability issues are integrated or linked within corporate accounting information systems (AISs) in line with contingent variables. The state-of-the art literature yields research findings regarding integration of sustainability into management control systems and performance measurement systems (Maas *et al.*, 2016; Schaltegger and Hörisch, 2017; Adams and Frost, 2008; Gond *et al.*, 2012; Wijethilake, 2017; Wijethilake *et al.*, 2017; Kerr *et al.*, 2015; Riccaboni and Leone, 2010; Morioka and Carvalho, 2016; Pryshlakivsky and Searcy, 2017; Searcy, 2012, 2016), AISs (Eccles and Krzus, 2010; Dillard *et al.*, 2016; Dillard and Pullman, 2017; Horst and Farzad, 2015; Alewine and Stone, 2017; Burritt and Schaltegger, 2014) and integrated management systems in a broader context (Gianni *et al.*, 2017; Singh *et al.*, 2012; Seleshi, 2011; Schaltegger and Burritt, 2018; Maletič *et al.*, 2018; Narayanan and Adams, 2017). However, sustainability and AISs have rarely been the focus of research. Traditionally, an AIS is a structure that a company uses to collect, store, manage, process, retrieve and report its financial data so that it can be used by managers, accountants, consultants, investors and other stakeholders. Expanding the limits of conventional AIS, in this paper, we specifically focus on the sustainability accounting information system (SAIS), i.e. how sustainability-related data are being collected, stored, managed, processed and reported for decision-making. Moreover, the contingency perspective is not so often included in the sustainability accounting context (Maletič *et al.*, 2018; Pryshlakivsky and Searcy, 2017), whereas the neo-institutional approach together

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with legitimacy theory and stakeholders theory are prevailing. To fill this gap, we raise the following research question:

RQ1. How are contingent factors related to the development of SAIS (namely, planning, design and implementation)?

This study extends the current knowledge on the topic, particularly the work of Reinking (2012), by adopting a contingency-based information system framework for an SAIS. Using the contingency-based approach, we aim to explain the SAIS profiles based on the interrelation of the contingent variables. Additionally, this study provides original empirical evidence from major Lithuanian companies by expanding the debate on contingency factors, which may explain the SAIS design.

Lithuania offers an important case for empirical research. Most previous research concentrated on investigating the state of the art of sustainability accounting in more developed Western European countries (and other world regions as well) with historically higher levels of social responsibility, democracy and market economy in comparison to Eastern European countries. Motivated by the EU accession (in 2004 and 2008), foreign ownership, competitive pressures and the influence of corporate governance, Central and Eastern European (CEE) companies have only started to initiate corporate sustainability practices (Horváth *et al.*, 2017) for about the past 10 years. It is not surprising that their corporate sustainability strategies and implementation practices might differ. It is also important to note that Lithuania is a small country, as most countries in the EU are, while sustainability accounting research is often dedicated to major countries such as the UK, Germany, France and Italy. We contribute to identifying the SAIS patterns of corporations operating in small countries that made transition from the USSR economy and post-communist reporting practices to sustainable management accounting and socially responsible business practices. We also found that corporate profile and strategic orientation are strongly linked with planning and the SAIS design. Unexpectedly, our research results reveal that the association between stakeholders' involvement and the SAIS design was not as strong as hypothesized *a priori*.

This paper proceeds in the following manner. Initially, the paper introduces the reader to previous research on sustainability accounting and information systems. Thereafter, the paper presents a theoretical framework based on the perspective of contingency theory. Section 3 explicates the research methodology. The empirical findings are presented in Section 4. Finally, in Section 5, the paper concludes with a discussion of the results in relation to previous research, a synthesis of the most important insights of this study, comments on this study's limitations and possibilities for further research.

2. Literature review, theoretical framework and development of Hypotheses

2.1 Previous research on sustainability accounting and information systems

By analysing prior research on SAIS we first looked for several keywords which were treated as synonyms: "sustainability accounting systems", "sustainability management accounting systems", "sustainability performance measurement systems", "sustainability control systems" and "sustainability information systems". The aim was to find out how the research studies and these concepts are distinguishable and what comprises the background of SAIS. We also referred to the findings of Maas *et al.* (2016) showing that various concepts (e.g. performance assessment, management accounting, management control and reporting) are defined and used in various ways, but mainly dealt within an isolated manner.

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A major stream of research in the field argued incorporation of sustainability issues within management accounting: management control systems (Durden, 2008; Maas *et al.*, 2016; Schaltegger and Hörisch, 2017; Gond *et al.*, 2012; Wijethilake, 2017; Wijethilake *et al.*, 2017; Kerr *et al.*, 2015; Riccaboni and Leone, 2010), performance measurement systems (Morioka and Carvalho, 2016; Pryshlakivsky and Searcy, 2017; Searcy, 2012, 2016) and business process management (Ammar, 2017).

A special focus is given to how management control systems may assure better involvement and implementation of sustainability-related activities. Gond *et al.* (2012) investigated whether management control systems contribute to a deeper integration of sustainability issues within the strategy. The authors carried out a comprehensive typology of eight ideals-type organizational configurations, explaining the roles and uses of management control and sustainability control systems in the integration of sustainability within corporate strategy. Integration, which is perceived as the degree of overlap between these two types of control systems, may be technical (e.g. methodological limits and common calculability infrastructure), organizational (e.g. roles and formal structures) and cognitive (e.g. communication platforms). In this paper, we do not specifically analyse links between control systems. Rather, we focus on how sustainability issues are integrated within AISs. However, in line with Gond *et al.* (2012) results, underlying management control conditions (e.g. existing information systems' conditions) may facilitate or prevent the actual integration of sustainability within strategy.

Moreover, integration within the traditional planning and monitoring systems, the combination of both formal and informal controls (Durden, 2008) and the coordination across business units and decentralized structures are key factors for successful implementation of sustainability-oriented strategies (Riccaboni and Leone, 2010). Based on a single case study of a large mutinational company, Riccaboni and Leone (2010) provide evidence that by using management accounting tools (e.g. Product Sustainability Assessment Tool), companies may bring sustainability considerations into the organizational reality and implement their sustainable strategies. Thus, we assume that SAIS also may translate abstract phenomena, such a sustainability, in directly visible and clear outcomes for an organization.

In line with Kerr *et al.* (2015), sustainability reporting may be integrated into management control systems, either entirely through proactive sustainability strategy (Wijethilake, 2017) or through tools such as the balanced scorecard. It is also important to notice that organizations use management control systems as a medium to respond strategically to institutional pressures for sustainability, and in turn, the use of management control systems has important implications for organizational change and improvement (Wijethilake *et al.*, 2017). The integration of sustainability into management control systems holds advantages for organizations to operationalize sustainability objectives and broaden stakeholder accountability (Kerr *et al.*, 2015). Nevertheless, sustainability performance measurement systems and their design have an insubstantial presence in the literature (Pryshlakivsky and Searcy, 2017), in particular with regard to the contingency-based approach (Maletič *et al.*, 2018). By using evidence from the literature, as well as contingency factors, Pryshlakivsky and Searcy (2017) have presented a heuristic model for establishing trade-offs in corporate sustainability performance measurement systems. This is particularly important for organizations seeking to establish, integrate or expand their environmental management systems into the area of sustainability.

On the other hand, the integration of sustainability management to the core business and the actual implementation of related measures are mainly caused by seeking corporate legitimacy (Schaltegger and Hörisch, 2017). The current scientific discussion revealed two

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basic existing approaches that might complement each other: the management approach (the so called "inside-out" approach; Burritt and Schalteger, 2010) and the institutional approach (the key is to respond to institutional changes and, afterwards, to gain an advantage).

The other large stream of studies analyse integration of sustainability issues into AISs. The EU Directive 2014/95/EU on disclosure of non-financial and diversity information, the International Integrated Reporting Framework are well-known initiatives towards integration of financial and non-financial information. Currently, more than three quarters of the world's largest 250 companies include at least some non-financial information in their annual financial reports (KPMG Survey, 2017). This trend inevitably leads to the greater integration of sustainability issues into traditional AISs.

Other studies focus on theoretical explorations for the potential integration of operational systems for monitoring and reporting environmental and social conditions, leading to sustainability (Dillard *et al.*, 2016; Dillard and Pullman, 2017; Bebbington *et al.*, 2007; Kaspersen and Johansen, 2016; Alewine and Stone, 2017). A sustainability reporting perspective may be incorporated into the design and use of AISs that address social and environmental objectives as well as economic ones (Dillard *et al.*, 2016). Moreover, the research of Dillard and Pullman (2017) showed how a management information and accountability system is designed to support the social and environmental objectives in the agricultural social enterprise. The authors were concerned with management information and accountability issues where the systems are more directed towards the reciprocity of practices that build trust and community than the traditional elements of control.

Based on a case study of a large multinational group, Kaspersen and Johansen (2016) presented how and why a specific programme, with auditability as its ultimate aim, changed the basis on which the external social and environmental report was prepared. Internal control and the establishment of organizational boundaries may be challenging when trying to change traditional accounting systems (Kaspersen and Johansen, 2016). By using the framework of general evaluability theory, Alewine and Stone (2017) elaborated on the evaluation mode in which the AIS provides available information with a particular focus on environmental accounting.

Nonetheless, some authors (Horst and Farzad, 2015; Schaltegger and Burritt, 2018) claimed that such SAIS neither exists in practice nor is treated scientifically in a comprehensive manner. The necessary condition for comprehensive change of internal processes and information systems lies at a strategic level (Horst and Farzad, 2015). Moreover, many studies emphasized the importance of corporate supply chains by analysing how sustainability issues are included in accounting information and management systems (Burritt and Schaltegger, 2014; Searcy, 2016). There is a lack of a broad sustainability focus because of complexity that stunts the impact on decision makers (Burritt and Schaltegger, 2014) and the need for transdisciplinary teams and an accountant's contribution (Schaltegger and Zvezdov, 2013) to increase connectedness and performance of the supply chain.

The third largest stream of research focuses on corporate sustainability and integrated management systems in a broader context (Gianni *et al.*, 2017; Singh *et al.*, 2012; Schaltegger and Burritt, 2018; Narayanan and Adams, 2017). Although there are various international efforts for measuring and integrating sustainability, only a few have an integral approach taking into account environmental, economic and social aspects (Seleshi, 2011). Mostly, the focus is on one of the three aspects, and sustainability is more than an aggregation of the important issues; it is also about their interlinkages and the dynamics developed in a system (Seleshi, 2011).

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By conducting a case study, Narayanan and Adams (2017) revealed that change towards integrating sustainability into organizational practices was mostly influenced by the corporate profit-seeking interpretive schemes and the associated calculative practices. And while this approach limited the depth of change, it did lead nevertheless to some degree of integration. It should be noted that, on the one hand, integrated management systems may provide the necessary holistic framework for the management of corporate sustainability (Gianni *et al.*, 2017). However, on the other hand, triple bottom line accounting and reporting may offer the metrics for effectiveness of integrated management systems (Gianni *et al.*, 2017; Singh *et al.*, 2012). Furthermore, there is also a continuous improvement component, meaning that the adoption and implementation of corporate responsibility practices are cyclical rather than linear processes (Vidal *et al.*, 2015). The integrated management system is seen as the vehicle which turns inputs (the resources) into sustainability results (Gianni *et al.*, 2017) based on the organizational value chain.

Assuming that corporate managers are concerned with creating business cases for their companies to survive and prosper in the long term, Schaltegger and Burritt (2018) identified four different kinds of business cases with regard to sustainability: reactionary and reputational business cases of sustainability, and responsible and collaborative business cases for sustainability. The evolution of sustainable accountability is also an organizational development and management programme that must be studied within the context of ecological ethics (Seleshi, 2011), in relation to the economic, social and environmental objectives of organizations, i.e. strategic orientation.

In summary, the literature reveals different attempts to integrate sustainability issues in line with corporate strategy through internal corporate information systems. In line with Otley (2016), we agree that in general a limited conceptualization of a management control system (and presumably of other types of information systems) permeates the literature. In this paper we do not specifically analyse links between information systems (e.g. configurations between control systems, Gond *et al.*, 2012), but rather focus on how sustainability issues are integrated within AISs. Taking into account an enormous diversity in organizations and different configurations of sustainability orientated practices (Maletič *et al.*, 2018), we suggest that the use of contingency theory would offer a new and useful perspective on the integration of sustainability issues into AISs.

2.2 Contingency theory-based approach in information systems

One of the first scientific attempts at AISs through the lens of the contingency theory in the accounting literature was a study conducted by Gordon and Miller (1976). This paper laid out the basic framework for considering AISs from a contingency perspective. The study explains how an AIS should be designed based on the following contingent variables: environment, organization and decision-making style. Later, Otley (1980) expanded this model by arguing that the design of AISs must be predicated on the effectiveness of the organization as well as the interrelation of the typical contingency variables: technology, environment and organizational form. The mere existence of a system design does not automatically confer that it is a successful design.

Based on Burritt and Schaltegger (2010), the definition of sustainability accounting is as follows:

> At one time a process through which information flows are organised and provided for management decision making and, second, a product (or service) to be obtained by internal and external parties with an interest in corporate sustainability information (p. 832).

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In this paper, a SAIS can be characterized as the process of the collection, analysis and communication (reporting) of sustainability-related information and the tools for decision-making. In many countries, there are no strict guidelines on what sustainability-related information should be collected and reported publicly for different stakeholders via specified channels. Contingency theory suggests that an AIS should be designed in a flexible manner and associated with certain defined circumstances (Otley, 2016) so as to consider the environment and organizational structure confronting an organization. Different information systems are created to address different orientations of business process management and are used for different managerial functions and purposes (Ammar, 2017).

In explaining the development of SAIS from the theoretical perspective, we used a contingency-based approach basically for two main reasons:

(1) no single information system can be universally applied to all companies in all situations (Gordon and Miller, 1976; Otley, 1980, 2016; Reinking, 2012), and configuration of organizational measurement systems can be shaped by the kind of practices companies adopt (Lucianetti *et al.*, 2018);

(2) not every information system will be effective for every organization because it is closely related with corporate characteristics (Ginzberg, 1980).

Hence, it could be stated that development of a SAIS, from the processes point of view, may be influenced by different contingency variables: environment (Maletič *et al.*, 2018; Gordon and Miller, 1976; Gordon and Narayanan, 1984; Otley, 1980, 2016; Lucianetti *et al.*, 2018; Morton and Hu, 2008), technology (Otley, 1980, 2016; Chenhall, 2003), company characteristics (Otley, 1980, 2016; Ginzberg, 1980), including business strategy (Maletič *et al.*, 2018; Wickramasinghe and Alawattage, 2007; Solovida and Latan, 2017; Lucianetti *et al.*, 2018) and company size (Wickramasinghe and Alawattage, 2007; Weill and Olson, 1989).

In developing a theoretical model, we refer to Reinking (2012), who identifies categories for contingency-based information systems: system development, which includes system *planning*, system *design* and system *implementation*; system performance; user *involvement*; and the Internet. In the theoretical model (Figure 1), we particularly focus on SAIS planning, design and implementation (internal corporate processes) as well as user (stakeholder) involvement and the communication via internet and other external and internal channels.

Corporate characteristics such as size, profile and structure have been found to be important contingent factors in understanding the design of corporate information systems (Wickramasinghe and Alawattage, 2007; Ginzberg, 1980). Additionally, organizational size has been included as a contingency variable in numerous empirical studies, and it is

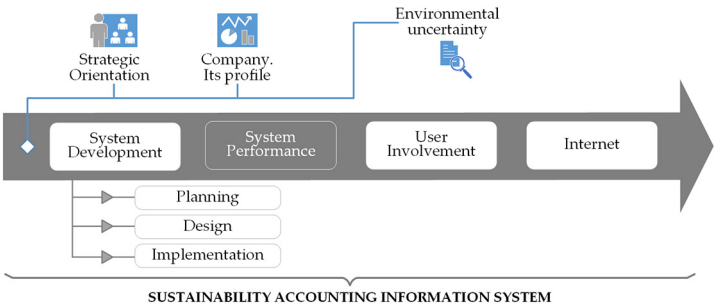

Figure 1.
Theoretical model

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purported to have a moderating influence (Weill and Olson, 1989). Large companies have much specialization, standardization and formalization, but in small companies, these features are less important (Wickramasinghe and Alawattage, 2007). This implies that companies need to attend to the issue of size when creating and planning the management and control systems, as well as other formal procedures together with standards and capabilities. It could be stated that small- and medium-sized companies will face challenges in creating and developing a unique SAIS because of the lack of professional staff and technological capabilities. Moreover, Morton and Hu (2008) identify a set of dimensions of organizational structure and resource planning information system characteristics that can be used to gauge the degree of fit, thus providing some insights into successful resource planning information systems' implementation. As such, the following hypothesis has been developed:

H1. Design of SAISs is related to corporate contingent characteristics.

Effective sustainability management requires strategy, structure and management systems that are aligned to coordinate a company's activity (Epstein and Roy, 2001). The managerial approach is primarily based on the corporate defined business strategy and its effective implementation through sustainability performance measurement, management and reporting (Burritt and Schaltegger, 2010). Referring to the contingency theory, one might suggest that strategic orientation could significantly influence the development of SAIS. Otley (2016), in his review of contingency theory of management accounting and control, claims that strategy has been hypothesized to affect control system design in a number of straightforward ways, depending on which categorization of strategy is used. As suggested by Wijethilake (2017), companies should proactively integrate sustainability aspects into strategy to enhance corporate sustainability performance in terms of the environmental, economic and social perspectives. Solovida and Latan (2017) found evidence that there is a significant effect of environmental strategies on the environmental performance of companies and that the role of environmental management accounting can mediate their relationship. Companies with an excellent environmental strategy are likely to integrate environmental performance measurement into their interactive control systems and corporate beliefs systems (Kerr *et al.*, 2015). By identifying different dimensions of sustainability integration into strategy through management control systems, Gond *et al.* (2012) theorize different configurations of control systems. Moreover, companies should develop sustainable business models that are based on a long-term orientation (Maletič *et al.*, 2018). On the other hand, the findings of Lucianetti *et al.* (2018) show that corporate strategy and the adoption of various advanced practices are not always straightforward, because a number of factors may influence the implementation of organizational strategies. In addition, Otley (2016) emphasizes that although many contingency works have been made to investigate the impact of strategy on control systems, the research is still fragmented, and it is difficult to find cumulative contributions. As such, the following hypothesis has been developed:

H2. The SAIS (planning, design, implementation) is related to corporate strategic orientation.

The literature underlines that environmental uncertainty is a fundamental driver for designing AIS among successful organizations (Lucianetti *et al.*, 2018; Gordon and Narayanan, 1984). As decision makers perceived greater environmental uncertainty, they tend to seek more external, nonfinancial and ex ante information in addition to internal,

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financial and ex post information (Gordon and Narayanan, 1984). Therefore, companies may adjust or create their SAIS by integrating more environmental dimensions and engineering-related aspects, i.e. information collected is mainly on environmental issues.

Frostenson and Helin (2017) in their study about conflicts in the process of sustainability reporting emphasize that to facilitate a clear stance and direction of this process, stronger top management involvement should be promoted. On the other hand, if the sustainability reporting preparation team is working in "isolation", in a relatively decoupled internal environment, one may assume that conflicts are more likely to occur and complicate the process.

Reinking (2012) claims that the examination of users in contingency research has been extensive. The inclusion of a user's participation in the development process is predicted to increase a user's satisfaction. In our study, we expand the "users" to "stakeholders" because we assume that the development of SAIS is related both to external and internal stakeholders (Adams and McNicholas, 2007). Moreover, the successful design, implementation and evaluation of SAIS entails taking pluralism seriously – that is, recognizing that multiple objectives and stakeholders need to be explicitly involved at all levels (Dillard *et al.*, 2016).

Taking into account environmental uncertainty as a contingency, we assume that users' (stakeholders) involvement might play an important role in developing SAIS (Zyznarska-Dworczak, 2018).

H3. Users' (stakeholders) involvement is important when implementing SAISs.

3. Research methodology

3.1 Data sampling

To test our research model and hypotheses, we used a survey-based questionnaire. An initial draft of the survey was discussed with academic scholars to ensure that the questions would be correctly understood and easily answered by respondents. The questionnaire took no longer than approximately 10-15 min to complete.

The survey targeted major Lithuanian companies. Lithuania (as well, as other Baltic countries) is an interesting European Union case study that may serve to illustrate the transition from the communistic planned economy and post-communist reporting practices towards normativity and socially responsible business practices. In general, corporate sustainability reporting is voluntary in Lithuania. It is worth mentioning that the adopted EU Directive (2014) Directive 2014/95/EU on the disclosure of non-financial and diversity information by certain large companies and groups with more than 500 employees covers approximately 6,000 large companies and groups across the EU. Certainly, its adoption fosters the release of sustainability reports, but still there is little evidence of Lithuanian companies knowing how they integrate sustainability issues into their management information systems. Companies are required to prepare annual reports, mandatory for financial and non-financial performance analysis, as well as environmental and employee-related information. The results of Dagilienė (2017) also reveal that companies of different sectors quite often include non-financial information in their annual reports. In times of financial economic crisis (2008-2009), disclosed non-financial information accounted for an average of 20.47 per cent of corporate annual reports, while in the post-crisis period (2013-2014), disclosed information accounted for an average of 16.08 per cent of corporate annual reports. Moreover, Central and Eastern European companies' accounting systems may be characterized by limited resources, primarily weaker financial and operational facilities, a

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lower level of human and intellectual capital and new technology (Zyznarska-Dworczak, 2018).

Hence, we addressed the largest top 100 companies in the country. According to OECD (2018), one of the most common criteria for this purpose in a statistical context is the number of persons employed. In this study, large companies employed 250 or more people. Both public and private companies were included to allow a holistic overview of corporate sustainability. Financial sector companies (banks, investment companies) were not included in the sample. We selected and targeted those responsible for sustainability accounting management as key providers of information.

The aim of the survey was to explore how sustainability-related data are being collected, stored, managed, processed and reported for decision-making in line with corporate strategy. To reflect the aim, the questionnaire consisted of two main parts: one of them considered the aspects of corporate sustainability strategy; the other explored the sustainability accounting information processes that cover the collection, analysis and communication of sustainability-related information. Finally, the basic questions about the corporate characteristics that may have a link with sustainability management were included in the questionnaire. Following the formulated research hypotheses, a questionnaire with multiple answer options was designed. Using an online survey service (LimeSurvey), we developed an online questionnaire as an instrument for this survey study. The questionnaire consisted of questions covering three main topics:

(1) corporate sustainability strategy/orientation (Table AI – Table AVI);

(2) SAIS (planning, design, implementation) (Table AVII – Table AXI);

(3) corporate contingent characteristics (Section 3.3).

The survey took place from June 2015 till September 2015. An invitation was sent by e-mail to the key contacts. They were contacted via phone and then directly via e-mail. Quite often respondents were reminded via a second or third mailing or a telephone call. We reached a high response rate at 75 per cent, i.e. 75 out of 100 companies returned the questionnaire. However, only 38 questionnaires were used for further analysis, as the other questionnaires were filled out partially.

3.2 Analysis methodology

In this study, all surveyed variables (questions in the questionnaire, also called categories) were evaluated using a Likert scale. A five-point Likert scale was selected because many responses (in the case of a seven-point scale) in the middle category would indicate too many possible answers and difficulties for respondents. In total, 23 variables were measured. For this purpose, the qualitative research methodology was used to gain insights into corporate's profile and its orientation to the sustainability issues.

To develop a global view of the data sample, the response rate was determined by exploring the spread of corporations among variables (categories). Then, bivariate analysis was used for testing the hypotheses established in Section 2.2. For this purpose, a χ^2 test, also known as a test for independence, was performed for each pair of variables in the data set. While using this test, the frequency (contingency) table formed by two variables was analysed to evaluate whether there is a significant association (Cadoret *et al.*, 2018; Le *et al.*, 2008). To support the hypotheses established by authors, the statistically significant associations were determined for p value $< \alpha$, where α denotes a significance level.

In general, even if the statistically significant associations were found during pairwise analysis between variables, it could still be unclear which parts of the variables

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(subcategories) were responsible for this link (Greenacre, 2017). To understand the hidden pattern of association in the data, each company was explored from a local view of their responses by concentrating on the subcategories of questions. This allows us to determine a response profile for a corporation. To this end, multiple correspondence analysis (MCA) was applied to determine a group of corporations with a similar response profile (Le *et al.*, 2008; Pagès, 2014). The number of dimensions (axes) was determined by exploring the percentages of inertia explained by each MCA dimension. To determine the significant variability explained by dimensions, the reference value was used, which is a q-quantile of the inertia distribution obtained by simulating data samples using a uniform distribution. Then, the response profiles were established on the basis of retrieved dimensions.

Finally, to draw up a typology of the surveyed companies, unsupervised classification on the dimensions obtained by MCA was performed (Le *et al.*, 2008; Kassambara, 2017). This aided in understanding the groups of clustered corporations by developing the profile for companies surveyed. For this purpose, a method of hierarchical ascendant classification using Ward's criterion to combine clusters had been chosen, which was performed on the MCA axes. To choose the number of clusters from a hierarchical tree, the concept of inertia gain was applied as had been published in the paper Husson *et al.* (2010).

3.3 Corporate contingent characteristics

Main variables used to describe a company are displayed in Figure 2: the number of persons employed (referred to as *Q6.4*) and the turnover generated (referred to as *Q6.5*). Figure 2(a) shows the distribution of persons employed. It can be seen that the majority of companies that responded to the survey ranged in size from 500 to 5000 employees. The distribution of companies measured in terms of the generated turnover varied more among classes, as 55 per cent of enterprises achieved €100-499 M, 27 per cent earned €50-99 M, 18 per cent exceeded the value of €500 M [Figure 2(b)].

To some extent, the worldwide activity of companies (referred to as *Q6.7*), defined as owning or controlling productions of goods or services in one or more countries other than the home country, also reflects the size of the company. Within the sample analysed, 53 per cent of companies were local ones, 29 per cent of them operated in fewer than 5 countries, and 18 per cent operated in at least 5 countries.

The distribution of sampled corporations among sectors (referred to as *Q6.1*) is presented in Table I. It is apparent from this table that just under half of the companies belonged to the Manufacturing sector, while others come from Electricity, Gas, Steam and Air Conditioning (16 per cent), Wholesale and Retail Trade (16 per cent), Construction (5 per cent), Information and Communication (5 per cent) and other sectors (13 per cent). The classification of companies into one of five specified ownership forms (referred to as *Q6.6*) is

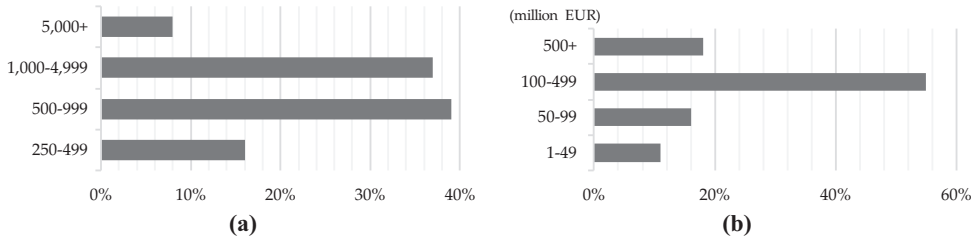

Figure 2.
Variables of corporates

Notes: (a) Number of full-time employees; (b) company's turnover

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	(%)
Industry	
Manufacturing	45
Electricity, gas, steam and air conditioning	16
Wholesale and retail trade	16
Construction	5
Information and communication	5
Other	13
Ownership form	
Privately held	42
Publicity traded	24
Privately held – family owned	21
State owned	11
Partly state – owned	3

Table I. Sectoral distribution of corporations and their ownership form

displayed in Table I. As can be seen from the table, the proportion of privately held companies was the highest.

Considering the business type of companies (referred to as *Q6.2*), Table II provides the summary of specific activities to be performed by companies. Most of them elaborated final products or services, and only 4 per cent of companies produced raw materials. More than half of the companies analysed was accounted for position in the supply chain or business profile (referred to as *Q6.3*), such as both business-to-business (B2B) and business-to-customer (B2C) products or services, 24 per cent of companies implemented B2C strategy, 15 per cent – B2B strategy (Table II).

To summarize, the variables introduced as questions in the questionnaire revealed the prevailing profile of companies used in the study.

4. Results

This section begins by discussing the results of hypothesis testing. Section 4.1 presents the analysis from a global point of view, as two variables (categories) were confronted and statistically significant associations were determined. It then proceeds to the application of MCA to determine hidden patterns in the data as was reasoned in Section 3.2. In the third subsection, the clusters of companies are presented on the basis of the hierarchical ascendant clustering approach.

	(%)
Business type	
Elaborate final products/services	82
Elaborate intermediate products/services	14
Extract raw materials	4
Business form	
B2B and B2C products/services	61
B2C products/services	24
B2B products/services	15

Table II. Business type distribution of corporations and their business form (position in supply chain)

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4.1 Hypothesis testing

In this section, three hypotheses (Section 2.2) established by the authors are tested by performing a χ^2 test (Section 3.2) for each couple of variables reflecting the hypotheses to be examined. As we aim to find the significant relationship between variables, the results of statistical inference analysis are provided for alternative hypothesis of the χ^2 test (Table III). In effort to maintain a good balance between Type I errors and Type II errors (Smith, 2011), the significance level α of 5 per cent was selected.

Results of *H1* (Table III) testing indicate that the association between the design of SAISs and companies' contingent characteristics is only significant in certain cases. The evidence shows that a corporation's sustainability strategy (*Q1.1*) is linked with the ownership form of a company (*Q6.6*), while the sustainability development (*Q1.4*) is in relation with business type. Next, the company's turnover (*Q6.5*) was reported to have a link with sustainable activities/practices (*Q1.2*) and supply chain requirements (*Q1.6*). Overall, we accept *H1* that corporate contingent characteristics are related to the development of SAISs.

To test *H2*, the corporation's sustainability strategy (*Q1.1*) is linked with variables from the questionnaire (*Q2.1 – Q5.1*), reflecting the planning, design and implementation of SAIS. During hypothesis testing (Table III), it was determined that relation is significant for the spectrum of information (*Q3.1*, *Q3.2*), for explaining who decides what aspects are covered within sustainability accounting (*Q2.1*), for the level of formalization of information generation (*Q4.5*), and also for the channel used for sustainability reporting (*Q5.1*). This implies that *H2* is confirmed.

H3 is formulated to test the involvement of users (stakeholders) (*Q1.4*, *Q1.5*) while implementing SAIS (*Q2.1 – Q5.1*). The results (Table III) deduce that the sustainability development (*Q1.4*) is in relation with *Q3.1*, referred to as the information spectrum collected regarding environmental and social aspects, and with *Q2.1*, which explains who decides what aspects are covered within sustainability accounting. The evidence shows that *Q1.5* relates with two variables (*Q3.1*, *Q3.2*) which describe the information spectrum collected regarding environmental and social aspects (*Q3.1*), as well as engineering-related themes and softer aspects (*Q3.2*). The other important indicators of implementation of AISs were reported as having no association with users' (stakeholders) involvement (*Q1.4*, *Q1.5*). To sum up, the association between stakeholders' involvement and the SAIS design was not reported to be as strong as was hypothesized theoretically.

Table III. Results of hypotheses testing for relations of categories

Relation	*p*-values, respectively	
H1		
Q6.6 ↔ *Q1.1*	0.006	*
Q6.2 ↔ *Q1.4*	0.031	**
Q6.5 ↔ *Q1.2*, *Q1.6*	0.044, 0.021	**
H2		
Q1.1 ↔ *Q3.2*	0.003	*
Q1.1 ↔ *Q2.1*, Q3.1, Q4.5, Q5.1	0.027, 0.025, 0.032, 0.047	**
H3		
Q1.4 ↔ Q3.1, Q5.1	0.008, 0.003	*
Q1.5 ↔ Q3.1, *Q3.2*	0.022, 0.014	**

Note: *, **significance level of 0.01 and 0.05, respectively

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4.2 Multiple correspondence analysis

In MCA terminology, the input into this procedure contains the following:

- Active objects: 38 companies that are used in the analysis (labelled 1 to 38); Active variables: subgroups of companies induced by the subcategories or a response profile. The list of active variables was conceived by applying a χ^2 test from a local point of view in order to determine the statistically significant associations between subcategories in questions. Table IV demonstrates the results of hypotheses testing for subcategories in order to retrieve parts of variables that are responsible for a link.

In general, when the test of independence is applied for subcategories, many statistically significant links may be retrieved, as what occurred in our case. Table IV lists only those relations between variables that were statistically substantiated with at least four subcategories in each relation just for demonstration purposes. To follow all three hypotheses established by the authors, the links determined were arranged respectively in the table. Clearly, in the following analysis all significant links were included to draw up a typology of the surveyed corporations.

MCA analysis was carried out to determine a group of companies with a similar response profiles by analysing the subcategories in questions. The proportion of variances retained by the different dimensions was determined by exploring the inertia distribution (Figure 3).

Figure 3 demonstrates the percentage of explained variances for the top ten MCA dimensions. It is a way to explore visually if there exist strong relationships between variables and to specify the number of dimensions that should be used in the analysis. The estimation of the right number of dimensions was performed by running a test, which

	Relations
H1	*Q6.5* ↔ *Q1.1, Q1.2, Q1.6, Q1.7*
H2	*Q1.1* ↔ *Q2.1, Q2.2, Q3.2, Q4.1, Q4.4, Q4.5*
H3	*Q1.4* ↔ *Q2.2,* Q3.1*, Q3.2, Q4.1,* Q4.2*, Q4.4, Q4.5, Q5.1*
	Q1.5 ↔ *Q3.1, Q3.2, Q4.1, Q4.2, Q4.5, Q5.1*

Table IV. Results of hypothesis testing for relations of subcategories

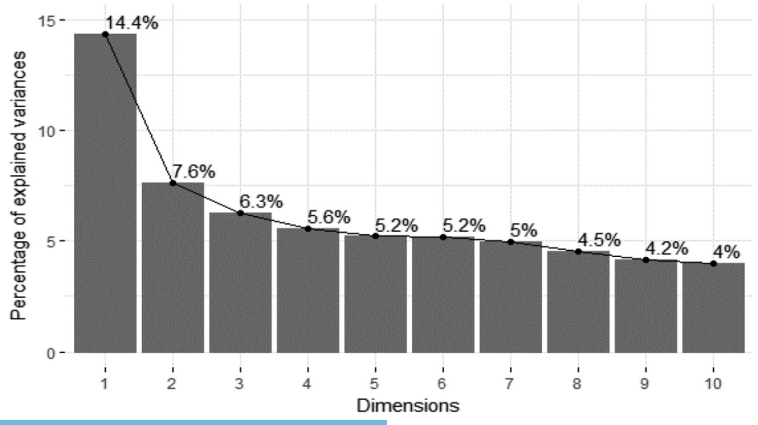

Figure 3. Decomposition of the total inertia on the components of MCA

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suggested to use the first two axes to retain 22 per cent of the total variation. The significance was determined on the basis of the reference value comparing it with the 0.95-quantile by simulating data tables following uniform distribution.

Figure 4 presents the results of the MCA by setting out the biplot of corporations represented by black numbers and variables (subcategories) displayed in blue. Top ten contributors (subcategories) to the dimensions and top ten corporations are only demonstrated in order to obtain a readable plot.

As can be seen in Figure 4, companies such as 16, 25 and 37 are in opposition to companies such as 5, 22, 24, 33 and 35 in Dimension 1, and also are in opposition to corporations such as 18 and 29 in Dimension 2. The distance between any two points provides a measure of their similarity. Companies that are on the same side of a given variable contribute considerably to this variable, while being on the opposite side of a given variable demonstrates a low impact. The investigation of top contributors to the formation of axes has shown that *Q5.1* = "Annual Report" and *Q3.1* = "Information collected is only on environmental issues" scored high on both dimensions, *Q4.5* = "To a very great extent" scored low on Dimension 1 but high on Dimension 2, *Q1.5* = "Irregular and incident-driven stakeholder communication/dialogue" contributed on Dimension 1, *Q1.1* = "Sustainability strategy is the main content of the corporate strategy" scored low on Dimension 1 but high on Dimension 2, etc. (are sorted from the highest contribution). A detailed description of the dimensions obtained during MCA is set out in the Table AXII - Table AXIII.

In the next section, we present our goal of developing a typology (or profile) of a corporation's attitude to sustainability using the clustering approach on the dimensions obtained by MCA.

4.3 Clustering

Following the methodology presented in Section 3.2, the hierarchical ascendant classification approach using Ward's criterion is used to classify companies into clusters. When the clustering approach is applied on the basis of MCA dimensions, the between-groups inertia is maximized and within-groups inertia is minimized. The optimal number of

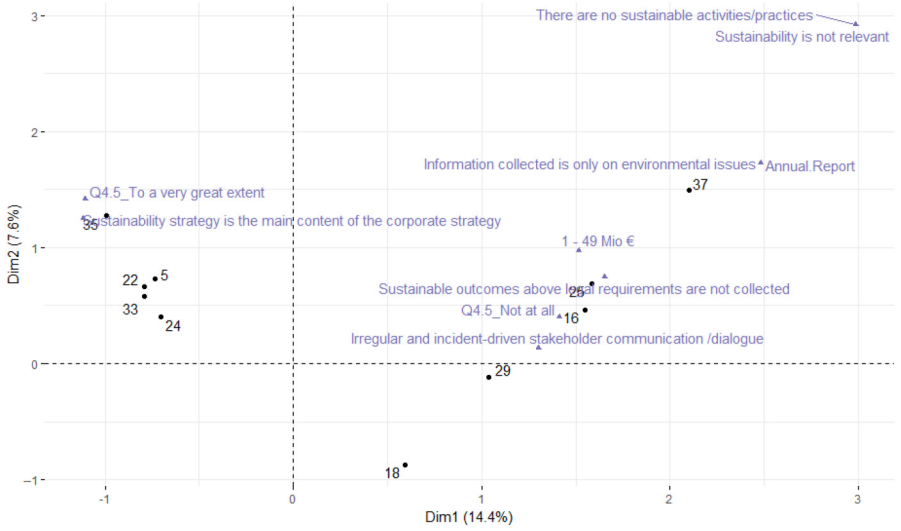

Figure 4.
Correspondence analysis map of corporates (labelled with numbers) and their response profile

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clusters is determined on the basis of inertia gain obtained. During the implementation of this approach, the corporations surveyed were assigned into three clusters; no outliers were determined. Figure 5(a) illustrates the scattering of companies as clusters in the Dimension 1 and Dimension 2 space from the MCA, while Figure 5(b) reveals the hierarchical grouping of companies into clusters.

As illustrated in Figure 5(a), all corporations surveyed were classified into three well-separated clusters that contain the most similar companies (labelled with numbers) on the basis of MCA dimensions. It can be seen that two clusters are large enough compared to the rest cluster on the top-right corner. The dendrogram, which is a tree-like display of clustering procedure, is displayed in Figure 5(b) to reveal how the companies were merged successively into clusters.

In the following, the detailed description is presented for each cluster to build a typology of corporations based on their response profile. We begin with technical description of each cluster by addressing their description on the basis of frequency for subcategories. This has allowed us to distinguish three distinct corporations' attitudes to the development of SAIS.

Cluster 1 is reflected by companies labelled with 5, 22, 24, 33 and 35. Its description is given in Table V. In total, 18 companies were assigned to this cluster.

Cluster 2 is characterized by companies labelled with 6, 8, 10, 15, 18, 19 and 29. Its description is given in Table VI. Cluster 2 consists of 17 companies sharing a similar profile.

Table VII presents Cluster 3, which is reflected by corporations denoted as 16, 25 and 37. In total, three companies were assigned to this cluster.

At this point, the final adjustments about the clusters are obtained, and their interpretation on the basis of corporations' attitude towards sustainability accounting are given as follows. Accordingly, we elaborated three SAIS profiles, namely, *integrated* (matching Cluster 1), *fragmented* (matching Cluster 2) and *compliance* (matching Cluster 3).

Surveyed companies that developed *integrated* SAIS may be characterized as acting socially and environmentally responsible along the entire supply chain, in line with research of Searcy (2016) and Schaltegger and Burritt (2018). They usually have their own standards, which often exceed the common requirements in the supply chain (Burritt and Schaltegger, 2014). What is more important, that outcomes are constantly collected, analysed and measured by using a sustainability accounting system that is linked with corporate strategy and objectives. Although *H3* was rejected, in particular, this profile may be characterized by active stakeholders' involvement, regular bottom-up and top-down stakeholder dialogue.

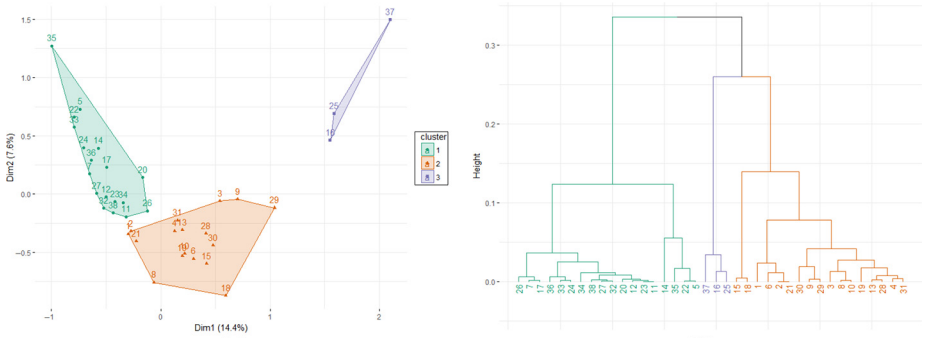

Figure 5. Hierarchical classification of corporates

Notes: (a) Clusters in the plane; (b) cluster dendrogram

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High frequency for subcategories	Low frequency for subcategories
Q1.7 = Outcomes are collected and analysed by a sustainability accounting system that is linked with strategic objectives/goals, *Q1.6* = Acting social and environmental responsible along the entire supply chain is required. Own standards often exceed the normal requirements., *Q1.5* = Regular bottom-up and top-down stakeholder dialogue, *Q4.4* = To a great extent, *Q3.1* = Information spectrum is balanced between environmental and social issues, *Q3.2* = Information spectrum is balanced between engineering-related themes and softer aspects, *Q4.1* = To a moderate extent, *Q4.5* = To a very great extent, *Q4.5* = To a great extent, *Q4.2* = To a great extent	*Q1.7* = Outcomes are single and isolated collected and analysed, *Q1.5* = Irregular and incident-driven stakeholder communication/dialogue, *Q4.4* = Not at all, *Q4.5* = To a slight extent, *Q1.2* = Sustainable activities/practices are unsystematic and isolated, *Q4.1* = To a very little extent, *Q1.1* = There is no sustainability strategy, *Q4.2* = Not at all, *Q4.1* = Not at all, *Q4.5* = Not at all

Note: High frequency subcategories are sorted from the most common, low frequency – from the rarest

Table V.
Characterization of Cluster 1

High frequency for subcategories	Low frequency for subcategories
Q4.5 = To a slight extent, *Q1.7* = Outcomes are single and isolated collected and analysed, *Q4.1* = To a very little extent, *Q4.4* = Not at all	*Q1.7* = Outcomes are collected and analysed by a sustainability accounting system that is linked with strategic objectives/goals, *Q1.6* = Acting social and environmental responsible along the entire supply chain is required. Own standards often exceed the normal requirements, *Q1.5* = Regular bottom-up and top-down stakeholder dialogue, *Q4.4* = To a great extent, *Q1.1* = Sustainability strategy is the main content of the corporate strategy, *Q4.2* = To a great extent, *Q4.5* = To a great extent, *Q4.5* = To a very great extent, *Q4.1* = To a moderate extent

Note: High frequency subcategories are sorted from the most common, low frequency – from the rarest

Table VI.
Characterization of Cluster 2

High frequency for subcategories	Low frequency for subcategories
Q5.1 = Annual.Report, *Q3.1* = Information collected is only on environmental issues, *Q1.5* = Irregular and incident-driven stakeholder communication/dialogue, *Q1.4* = Sustainability is mainly a PR/Marketing concept, *Q4.1* = Not at all, *Q3.2* = Information collected is mainly on engineering-related themes, *Q1.7* = Sustainable outcomes above legal requirements are not collected, *Q6.5* = 1 - 49 Mio €, *Q4.4* = To a slight extent	*Q1.4* = Sustainability is implemented as an organization principle and is involved in the whole corporate management, *Q3.2* = Information spectrum is balanced between engineering-related themes and softer aspects, *Q1.5* = Regular bottom-up and top-down stakeholder dialogues

Note: High frequency subcategories are sorted from the most common, low frequency – from the rarest

Table VII.
Characterization of Cluster 3

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Applied reporting guidelines are relevant to a moderate extent. Meanwhile, the whole process of sustainability accounting is centralized around a single information system and a single department to a great extent. Also, the information generation process is formalized to a very great extent. Sustainability data are routinely generated to a great extent. Moreover, companies seek to balance information spectrum between engineering themes and softer aspects. In this case, integrated SAIS expresses a strong relationship among corporate strategy, sustainability practices and accountability. The integrated profile patterns confirm the newest research about the necessity of integrated management systems in a broader context (Gianni *et al.*, 2017; Singh *et al.*, 2012) to provide the necessary holistic approach, as well as integration of financial and non-financial information (Dillard *et al.*, 2016; Dillard and Pullman, 2017; KPMG Survey, 2017).

Companies that developed *fragmented* SAIS neither include sustainability issues into their core strategy nor emphasize social and environmental responsibility. It is important to notice several features of *fragmented* SAIS: sustainability outcomes are not related to the results of main activity, the information generation process is hardly formalized, reporting guidelines are hardly applied and the process of sustainability accounting is totally decentralized both in the points of view of the department and information system. Sustainability data are not routinely generated, which means that information systems are not prepared to collect, analyse and measure sustainability information systematically.

Companies that developed SAIS *compliance* also do not include sustainability issues in the core strategy systematically, but they mainly seek to comply with the legal requirements. In line with the research of Schaltegger and Hörisch (2017) and Schaltegger and Burritt (2018), the integration of sustainability management to the core business is mainly caused by seeking corporate legitimacy. Additionally, the *compliance* profile may be characterized by the following features: the final output is an annual report (i.e. the focus is only on mandatory information), information is only collected on environmental, engineering issues; and sustainability is rather for seeking legitimacy, not for organizational principles.

5. Discussion, limitations and further research

Companies create sustainability reports and report what they want in terms of sustainability performance. Theoretically, business profiles and strategic orientation are contingencies (Reinking, 2012; Otley, 1980, 2016; Maletič *et al.*, 2018) that are related to the SAIS design. Our research results reveal that although companies surveyed mostly include the incorporation of sustainability strategy into corporate strategy and the sustainability dimension into the whole corporate management (Table AI), the links almost disappear at the information systems level. Outcomes of implementation of sustainability strategy have been valuated as isolated, not linked with a strategic objective. Given that 74 per cent of companies indicate sustainability strategy as the main content or part of the corporate strategy, only one-third of companies relate their sustainability performance outcomes with corporate strategic goals. This is consistent with the research of Maas *et al.* (2016) on isolation of different concepts, used in companies. The degree to which the sustainability information is integrated into overall corporate management definitely still varies very significantly from company to company (for more details, see, e.g. KPMG Survey, 2017). Furthermore, business companies still face challenges by converting their sustainability goals on an operational level, although there is a continuous improvement component (Vidal *et al.*, 2015). In line with research (Lucianetti *et al.*, 2018; Solovida and Latan, 2017), we would emphasize that the adjustment between organizational strategy and the development of SAIS should be prioritized. In fact, many managerial practices are currently adopted for

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reasons beyond strategic relevance (Lucianetti *et al.*, 2018), mainly seeking legitimacy (Schaltegger and Hörisch, 2017), whereas the real shift of including sustainability issues in information systems occurs at the strategic level (Horst and Farzad, 2015), based on management's ethical motivations (Schaltegger and Burritt, 2018).

Different sustainability integrations into strategy through management control systems may result in diverse configurations of control systems (Gond *et al.*, 2012). In this sense, in line with a contingency-based approach, we assume that there is no one uniform approach and that we need creative, targeted and strategic approaches (Maas *et al.*, 2016) to integrate sustainability issues into AISs. However, based on the contingencies derived from the literature review and theoretical framework we elaborate different SAIS profiles.

Again, when it comes to SAIS features, we can notice that characteristics such as applied methodology, formalization and routine of sustainability data generation, centralization around a single department and a single information system are expressed as quite moderate. Most companies that try to integrate sustainability into their core strategy (*fragmented* and *compliance* profiles) hardly formalize the whole sustainability accounting process by applying various sustainability reporting frameworks and generating data routinely. We may assume that it is not a natural everyday practice, but some kind of separate activity (Maas *et al.*, 2016) or isolation (Frostenson and Helin, 2017) that usually has been evaluated apart from other data, not making management decisions based on these data. This is also confirmed by the fact that sustainability data are mostly centralized around one single department, and it is mostly or modestly centralized around one information system (*integrated* profile). Our results partially support the central conclusions of Lucianetti *et al.* (2018), that there is a lack of a significant relationship between organizational strategy and implementation of the operational actions, in particular for *fragmented* and *compliance* SAIS. In line with Windolph *et al.* (2014), companies could shift from *fragmented* and *compliance* systems by adopting sustainability management tools, such as standards and frameworks.

Usually companies need to identify the most relevant issues for their sustainability strategy. They often approach this task with a methodical process of materiality assessment. Traditionally, companies talk with external and internal stakeholders, such as board members, executives, customers, investors and NGOs. Here, it cannot be over-emphasized that companies surveyed do not tend to communicate their results for their external stakeholders, e.g. customers, NGOs, suppliers, investors. We are making this assumption based on the fact that the most commonly used communication channels are internal: intranet internal reports followed by website reports. Only a small amount of companies prepare Web-based sustainability reports (18 per cent) and integrated reports (3 per cent), although sustainability reporting is aimed in general at the company's external stakeholders (Horváth *et al.*, 2017) to gain corporate legitimacy (Schaltegger and Hörisch, 2017) or to show the image of an untarnished company (Frostenson and Helin, 2017). However, more importantly, companies do not try to reduce environmental uncertainty by involving stakeholders in the process of sustainability reporting, which is not a common practice of large companies (Gray *et al.*, 2003; Adams and McNicholas, 2007; Fortanier *et al.*, 2011). Moreover, addressing the specific information needs of the stakeholders requires involving them in the reporting process (Adams and McNicholas, 2007). On the other hand, previous research (Adams, 2002) has highlighted variations in CSR disclosure according to the country of origin. Although European companies historically serve as an example for other regions in sustainability reporting, this might not be the case for Eastern Europe. An underlying reason for this might be that stakeholders were not clearly identified (Durden, 2008) by the companies surveyed. Our findings cannot confirm this issue as most companies

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do not issue external sustainability reports. The rejection of *H3* may be theoretically linked to the fact that regular bottom-up and top-down stakeholder dialogue is mainly realized by internal communication sources. This means that employees are the main stakeholders for the surveyed companies. Our results aligned with Horváth *et al.* (2017) in suggesting that Lithuanian companies mostly disclose social issues and related information involving employee affairs. Moreover, Frostenson and Helin (2017) also claim that conflicts in preparation of sustainability reports are more likely to occur by working in "isolation", in a relatively decoupled internal environment. Overall, our theoretical framework has been supported by the empirical data. However, the link between stakeholders' involvement and the implementation of SAIS should be further explored.

For practitioners, this study offers insights into helping to better understand SAIS processes and their development. Although there is no one-size-fit system for all companies, based on our findings, we elaborated three SAIS profiles. *Integrated* SAIS might serve as management model in Eastern European companies, fulfilling the stakeholders' needs both internally and externally (Zyznarska-Dworczak, 2018). Meanwhile, *fragmented* and *compliance* SAIS profiles clearly show the lack of integrating sustainability into companies' activities. We wish to emphasize for corporate managers the need to integrate sustainability issues into AISs as a way to foster both the social responsibility and the exploitation of the existing capacities within a company.

From a theoretical point of view, our research has implications for the application of contingency theory for SAIS. Corporate characteristics and strategic orientation, assumed as contingencies in our research, were confirmed as expected. We also contribute to the debate on SAIS development at non-financial companies from post-socialist economies, which do not have a long history of market economy and socially responsible business.

5.1 Limitations

We concede that our study was hampered by inherent limitations; however, these should be seen as opportunities for future research. The first concession is that the lack of support of *H3* cannot be totally explained by the data we collected. The results show that companies surveyed do not tend to communicate their results for their external stakeholders by issuing external sustainability reports. Therefore, this issue needs a deeper investigation, how companies define their key stakeholders, whether companies use other procedures and means for involvement of stakeholders.

Another limitation is the focus on only one country, Lithuania. Given that our research is based on a small size of the data set, the findings from such analysis should be treated with considerable caution in terms of their generalizability. Notwithstanding this limitation, the current study and the lack of similar evidence suggest validating the results by gathering a larger sample size. The results of this study will at least serve as the foundation for further research in developing theoretical SAIS profiles and testing it on a larger sample.

5.2 Further research directions

Recently, corporate information systems have greatly changed, especially the analytics used for management purposes. In this sense, efforts to convert sustainability into an operational level have not changed hand in hand. Thus, currently, there is a gap between the isolated SAIS applied and the demand of sustainability information that could be used for management decisions. Companies should seek new ways to integrate sustainability into their strategy through advanced AISs, as data-driven solutions are evolving to meet those needs. Moreover, as sustainability issues are becoming more central to business strategy,

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companies require new types of non-financial data and data analytics: a possible further step of future research.

At the same time, future research should expand the scope of SAIS research and focus on the in-depth analysis on sustainability report creation by evolving the multidimensionality of information sources and data analytics. Most of the major companies in line with the EU Directive 2014/95/EU are already obliged to present non-financial information publicly. It would be worthwhile to compare the change of AISs incorporating sustainability after legitimatization. Furthermore, following global trends (KPMG Survey, 2017), there should be research on the qualitative gap between leading companies and those playing catch-up, especially in East European countries where civic society is underdeveloped and there is no great pressure from external stakeholders to address sustainability.

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Appendix 1

The survey questionnaire consisted of questions covering three topics:

(1) corporate sustainability strategy/orientation;

(2) sustainability accounting information system (planning, design, implementation); and

(3) corporate contingent characteristics.

The investigation of contingent characteristics observed is presented in the main text (Section 3.3). Here, the analysis of responses covering first two topics is provided.

Table AI – Table AVI cover the questions and response rate that reflect corporate sustainability strategy/orientation.

Q1.1 Sustainability strategy	
There is no sustainability strategy	18 %
There is a sustainability strategy but it is not related to the corporate strategy	8 %
Sustainability strategy is part of the corporate strategy	61 %
Sustainability strategy is the main content of the corporate strategy	13 %

Table AI. Question *Q1.1*

Q1.2 Sustainable activities/practices	
There are no sustainable activities/practices	2 %
Sustainable activities/practices are unsystematic and isolated	21 %
Sustainable activities/practices are systematic and refer to our strategy	53 %
Sustainable activities/practices are involved in (almost) every part of the value chain	24 %

Table AII. Question *Q1.2*

Q1.4 Corporate sustainability	
Sustainability is not relevant	2 %
Sustainability is mainly a marketing concept	8 %
Sustainability is a strategic management responsibility and task (e.g. integrated in incentive system)	13 %
Sustainability is implemented as an organization principle and is involved in the whole corporate management	76 %

Table AIII. Question *Q1.4*

Q1.5 Stakeholder communication	
There is no stakeholder communication/dialogue	–
Irregular and incident-driven stakeholder communication/dialogue	24 %
Regular bottom-up stakeholder dialogue	13 %
Regular bottom-up and top-down stakeholder dialogue	63 %

Table AIV. Question *Q1.5*

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Table AV.
Question *Q1.6*

Q1.6 Requirements on supply chain	
There are no specific requirements	8 %
Acting social and environmental responsible along the supply chain is partially required	24 %
Acting social and environmental responsible along the entire supply chain is expected and required, but there is no own standard	18 %
Acting social and environmental responsible along the entire supply chain is required. Own standards often exceed the normal requirements	50 %

Table AVI.
Question *Q1.7*

Q1.7 Sustainability accounting	
Sustainable outcomes are not collected	11 %
Outcomes are single and isolated collected and analysed	42 %
Outcomes are collected and analysed by a sustainability accounting system that is linked with strategic objectives/goals	39 %
Outcomes are collected and analysed by a sophisticated sustainability accounting system as the basis for all corporate decisions	8 %

Table AVII – Table AXI cover the questions and response rate reflecting the planning, design and implementation of sustainability accounting information system.

Table AVII.
Questions *Q2.1* and *Q2.2*

	Operational managers (%)	Accounting specialists (%)	Sustainability managers (%)	Senior management (%)	Others (%)
Q2.1 Who decides what aspects are covered within sustainability accounting?	9	3	–	79	9
Q2.2 Who collects the data for sustainability accounting?	32	15	3	18	32

Table AVIII.
Question *Q3.1*

Q3.1 How balanced is the information collected regarding environmental and social aspects?	
Information collected is only on environmental issues	2 %
Information collected is mainly on environmental issues	21 %
Information spectrum is balanced between environmental and social issues	65%
Information collected is mainly on social issues	12 %
Information is collected only on social issues	–

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Q3.2 How balanced is the information collected regarding engineering-related themes (e.g. production optimization or energy efficiency) and softer aspects (e.g. employee satisfaction)?	
Information collected is only on engineering-related themes	3 %
Information collected is mainly on engineering-related themes	21 %
Information spectrum is balanced between engineering-related themes and softer aspects	76 %
Information collected is mainly on softer aspects	–
Information collected is only on softer aspects	–

Table AIX.
Question *Q3.2*

	Not at all (%)	To a great extent (%)	To a moderate extent (%)	To a slight extent (%)	To a very little extent (%)
Q4.1 To which extent are reporting guidelines (e.g. GRI-Guidelines) relevant for sustainability accounting?	26	8	21	24	21
Q4.2 To which extent are sustainability data routinely generated?	18	13	27	39	3
Q4.3 To which extent is the process of sustainability accounting centralized around a single department?	26	28	24	14	8
Q4.4 To which extent is the process of sustainability accounting centralized around a single information system?	23	24	29	13	11
Q4.5 To which extent is the information generation process formalized?	15	14	34	24	13

Table AX.
Questions *Q4.1*-*Q4.5*

	Annual report (%)	Integrated report (%)	Internal report (%)	Internet based reports (%)	Intranet (%)	Web-based report (%)	Stand alone sustainability report (%)	Other (%)
Q5.1 Which channel is used for sustainability reporting?	3	3	15	6	46	18	3	6

Table AXI.
Question *Q5.1*

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Appendix 2

A detailed description of MCA dimensions is given. Table AXII refers to the description of the first axis, and Table AXIII – the second axis.

	Positive coordinate on the axis	Negative coordinate on the axis
High frequency	*Q5.1* = Annual Report, *Q3.1* = Information collected is only on environmental issues, *Q3.2* = Information collected is mainly on engineering-related themes, *Q1.5* = Irregular and incident-driven stakeholder communication/dialogue, *Q4.1* = Not at all, *Q4.4* = To a slight extent, *Q1.7* = Sustainable outcomes above legal requirements are not collected, *Q1.4* = Sustainability is mainly a PR/Marketing concept	*Q1.6* = Acting social and environmental responsible along the entire supply chain is required. Own standards often exceed the normal requirements, *Q3.1* = Information spectrum is balanced between environmental and social issues, *Q3.2* = Information spectrum is balanced between engineeringrelated themes and softer aspects, *Q1.7* = Outcomes are collected and analysed by a sustainability accounting system that is linked with strategic objectives/goals, *Q1.2* = Sustainable activities/practices are systematic and refer to our strategy, *Q5.1* = Internal reports, *Q4.5* = To a very great extent, *Q4.4* = To a great extent, *Q4.2* = To a moderate extent and *Q4.1* = To a moderate extent
Low frequency	*Q1.4* = Sustainability is implemented as an organization principle and is involved in the whole corporate management, *Q1.5* = Regular bottom-up and top-down stakeholder dialogue, *Q3.2* = Information spectrum is balanced between engineering-related themes and softer aspects	*Q1.2* = Sustainable activities/practices are unsystematic and isolated, *Q1.7* = Outcomes are single and isolated collected and analysed, *Q4.1* = Not at all, *Q1.1* = There is no sustainability strategy, *Q1.5* = Irregular and incident-driven stakeholder communication/dialogue, *Q1.6* = Acting social and environmental responsible along the supply chain is partially required, *Q3.2* = Information collected is mainly on engineering-related themes, *Q4.2* = Not at all, *Q4.4* = Not at all, *Q4.5* = Not at all

Table AXII.
Description of Dimension 1

Note: High frequency subcategories are sorted from the most common, low frequency – from the rarest

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	Positive coordinate on the axis	Negative coordinate on the axis
High frequency	5 *Q5.1* = Annual Report, *Q3.1* = Information collected is only on environmental issues, *Q3.2* = Information collected is mainly on engineering-related themes, *Q1.5* = Irregular and incident-driven stakeholder communication/ dialogue, *Q4.1* = Not at all, *Q4.4* = To a slight extent, *Q1.7* = Sustainable outcomes above legal requirements are not collected and *Q1.4* = Sustainability is mainly a PR/ Marketing concept	*Q1.7* = Outcomes are single and isolated collected and analysed, *Q3.1* = Information collected is mainly on environmental issues and *Q4.4* = Not at all
Low frequency	*Q1.4* = Sustainability is implemented as an organization principle and is involved in the whole corporate management, *Q1.5* = Regular bottom-up and top-down stakeholder dialogue and *Q3.2* = Information spectrum is balanced between engineering-related themes and softer aspects	*Q1.6* = Acting social and environmental responsible along the entire supply chain is required. Own standards often exceed the normal requirements

Note: High frequency subcategories are sorted from the most common, low frequency – from the rarest

Table AXIII. Description of Dimension 2

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