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Dynamic Corporate Governance, Innovation, and Sustainability: Post-COVID Period

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Abstract: Recent complex changes of the organizational environment urge the boards of directors of energy corporations to step up quickly in crises (e.g., COVID-19) and foster innovation, to seize new strategic opportunities (e.g., environmental, social, and governance (ESG) investments). The purpose of the study is to provide in-depth analyses of ESG projects during the COVID-19 pandemic, through the lens of an emerging theoretical approach, dynamic corporate governance (CG). The research is built on the multi-case study method at large energy companies and energy startups. The research goal was to empirically analyze theoretical opportunities of dynamic board behavior in this research context. The major findings show that ESG projects faced serious challenges in the fast-changing organizational environment generated by COVID-19, which induced board intervention regarding innovation, networks, and organizational changes. This study is among the first to offer a novel theoretical viewpoint, by integrating CG and strategic management theories, besides the already dominant financial and reporting aspects. From a practical perspective, our conclusions might direct the attention of boards of directors toward innovation, networks, and organizational changes, in order to enable adaptation in turbulent times and increase sustainability in the social and environmental dimensions.

Keywords: corporate governance; innovation; organizational change; inter-organizational networks; energy sector



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1. Introduction

Ensuring economic, environmental, and social sustainability is one of the most important goals of corporate governance (CG), which has been extensively discussed within different industries [1–4]. This goal is especially challenging in the energy sector, where companies have faced serious financial burdens (e.g., caused by drops in oil prices) but are expected to provide affordable, secure, and reliable energy, while focusing on sustainable energy development and climate change concerns [5]. Consequently, CG research in the energy sector could have strategic and practical significance, impacting on sustainable transitions. From a theoretical perspective, the dominant research areas of this sector, which integrate sustainability and CG topics, usually focus on corporate social responsibility (CSR), CSR reporting and the financial outcomes of implementing and reporting CSR activities [6–8]. While the financial and reporting aspects derive from the “sustainability” root of this research, the CG theoretical background of many studies is limited to the agency theory and the stakeholder theory [9]. Finding new methods of CG research and practice should receive increased attention in the era of ESG (environmental, social, and governance) pressures and opportunities [10,11], and the macroenvironmental changes generated by COVID-19, which also affect the energy sector [12]. As ESG- and COVID-19-related issues represent significant challenges at CG level [13–17], these environmental factors could also drive novel solutions to the CG mechanisms that could hamper sustainable transitions;

e.g., lacking competence or inflexible institutions in a new environment [18], power imbalances and games [19,20], viewing change only as a risk [21], or irresponsible routines [22,23]. Despite the strategic (and social) significance of these issues and the adaptation capability, there have only been a few studies that applied novel approaches for sustainability-oriented CG [24,25].

The strategic importance of ESG projects (and mainly the “environmental” initiatives) in the energy sector is especially relevant in the context of research in Hungary, where two impactful national strategies have been published during the COVID-19 pandemic: the “National Energy Strategy 2030, with an outlook up to 2040” published in 2020, aiming at decarbonization with various tools (e.g., higher biomethane production, rapidly increasing PV capacities, or seasonal energy storage with power-to-gas technology) [26]; and Hungary’s National Hydrogen Strategy, published in 2021, focusing on the production of low-carbon and decentralized carbon-free hydrogen, decarbonizing industrial consumption, green transport, and developing the electricity and gas support infrastructure [27].

Within the context of the turbulent changes, new opportunities, and challenges that energy companies face in the global energy sector, including in Hungary, a novel research direction can be built on the dynamic corporate governance approach. It emphasizes the role of boards of directors in fast environmental adaptations [28,29], instead of agency costs [30], and besides balancing the different interests of stakeholders [31], and could integrate a different CG-theory (resource-dependency [32]) with a strategic management approach (resource-based view of the firm [33]).

Besides the main research gap (the absence of strategic viewpoints in sustainability-oriented CG research), the opportunity for a theoretical contribution (dynamic CG), and the contextual actuality and relevance (the need for rapid strategic adaptation and ESG projects of energy companies in Hungary), the research question was methodologically influenced by [34] arguing that qualitative comparative analysis can be useful to “discover different configurations of CG characteristics and other firm-level factors that improve or harm environmental sustainability outcomes” (p. 1489). Consequently, these factors led to the following research question:

How could dynamic CG be interpreted in larger and smaller energy companies that are planning and/or implementing ESG projects to increase sustainability?

Regarding practical implications, the study contributes to the sustainability-oriented CG literature, by showing that the success of ESG projects might depend on proper board-level answers to resource-based constraints and opportunities generated by a dynamically changing environment.

The study is structured, as follows: The next section contains the literature review, the theoretical framework, and the presumptions. In the Section 3, the research setting and methodological choices are presented. After that, the results of the analyzed projects are summarized, followed by a discussion about contributions and theoretical implications. Finally, conclusions, limitations, and future research directions are elaborated.

2. Literature Review

2.1. Corporate Governance and Sustainability Research in the Energy Sector and Beyond

In the sustainability-oriented corporate governance literature, numerous publications address sustainability as part of the CSR performance of an organization and discuss the financial consequences of various CG practices and CSR reporting [10,35–37]. By analyzing the results of different kind of studies, one can see the complexity that boards have to handle. For example, [38] showed that corporate sustainability reporting might mislead investors, while [39] found CSR reporting to be positively related to the market value of a firm and/or brand value [40]. These results suggest that boards might face ethical challenges when they aspire to increase CSR and financial performance. Furthermore, the complexity may be increased by the applied incentives, which influence board decisions. For example, [41] argued that the probability and quality of disclosure could be affected by (long-term) incentives for executive directors.

Other topics also reinforce that board decisions are crucial regarding strategic outcomes. For example, [42] argued the need for considering stakeholder trust for sustainability. While the debate over the financial outcomes of CSR, in general, and in the energy sector, has obtained remarkable attention [7,43], recently, ESG related questions are coming under researchers' focus. For example, [10] analyzed the relationship between the ESG score and firm value in their empirical study focusing on India; while, [44] recently analyzed the role of ESG (environmental, social, and governance) initiatives and institutional development in driving innovative performance, which also drew attention to the strategic significance of the topic. Nevertheless, in-depth analysis of CG and sustainable transitions with strategic management aspects within the energy sector has been less represented in recent publications.

This trend is in line with research directions within other industry sectors. Studies are mainly based on stakeholder theory and agency theory, which are adequate for analyzing CG structures and mechanisms and their relationship with sustainability, but there is a need for further theoretical and methodological approaches, in order to highlight specific problems or perspectives regarding CG and sustainability [9]. Despite this, there have only been a few publications that offer new paths for sustainability-oriented CG research and actions. One example is [24], who argued that new CG guidelines are needed to support organizational innovation aimed at sustainability. In another recent study, Ref. [25] suggested that energy companies could increase sustainability through the social capital of board members.

2.2. *The Background of Dynamic Corporate Governance*

Based on the above, the goal of this study was to contribute in-depth strategic analyses and offer a novel point of view besides the dominant financial and CSR reporting aspects of CG: the agency theory, and the stakeholder theory.

CG research has received increasing attention since the 1970s [45], traditionally focusing on principal-agent theory [30,46], while stakeholder theory has influenced CG research since the 2000s [31,47]. Other significant approaches of recent decades include stewardship theory [48], transaction costs [49,50], resource-dependency theory [32], and managerial and class hegemony [51]. CG research has also integrated more topics from strategic management, which are highly relevant in this research. Novel studies have started to focus on dynamic responsiveness, including leadership, environmental adaptation, internal mechanisms, coordination, collaboration, and external social process [28]. This approach is closely related to the resource-based view of the firm [52], following [53], who first suggested in 2003 that researching the "dynamic implications for board capital requirements, and, therefore, for board composition" (p. 394) is a promising direction. Recently, [29] has gone even further, in discussing risk management at a CG level, based on the dynamic capabilities framework [54], which is one of the most influential resource-based theories. As dynamic capabilities are important to enhance innovation and entrepreneurial behavior [33], it is also important to highlight that the literature has recently considered the governance characteristics and challenges of, not only incumbent companies, but innovative startup companies as well [55,56]. While dynamic board behavior can be considered as a promising area for research at large (energy) companies, ventures also "present an attractive research context that offers new opportunities for corporate governance scholars" [57] (p. 252). Sustainability-oriented research, however, has not yet focused on CG mechanisms of startups, but rather on CSR activities and impacts, which have been well-known topics at established companies. For example, Ref. [58] analyzed the drivers of sustainable business model and CSR engagement of startups; while, Ref. [59] focused on the non-financial and financial performance of CSR and competitiveness at venture companies. Consequently, the authors aim to take one more step, by studying sustainability and corporate governance also at startups to fill in this research gap, as well as the absence of strategic viewpoints in sustainability-oriented CG research.

2.3. Theoretical Framework

There is a broad consensus in strategic management literature regarding the significance of adaptive capabilities in a fast-changing environment, in order to sustain competitiveness. While companies need to efficiently exploit their current business areas and explore new ones and innovate to ensure long-term effectiveness, many organizations follow only exploitative routines [60–62], which is also found in the energy sector [63,64]. Based on the resource-based theory of the firm, however, a sustainable competitive advantage can be built on organizational resources that are rare, valuable, inimitable, imperfectly replaceable, and embedded into organizational operations [52]. One of the influential ideas of the resource-based view is that the relationship between the environment and the organization is not unilateral, but organizational performance (e.g., innovation) can shape the environmental conditions (e.g., competition) [33]. In this sense, some theorists emphasize the role of tacit knowledge integration [65], while the dynamic capabilities framework suggests that companies need to sense new opportunities, seize them by developing new business models, structures and processes, and transform the organization [54]. Ref. [33] mentioned the role of CG concerning transformation, as the board of directors should align managerial incentives with strategic goals, minimize agency costs, and be financially and strategically responsible when they decide on board composition, strategic directions, and profits (investing into the future). These considerations are supported by empirical data as well. For example, the CG structure, the resource-allocation process, and the incentive scheme for the management affects the organizational capability for adaptation [66]. Consequently, not only the strategy, the structure, the behavior, and the control of the day-to-day operations and the management should dynamically change in line with the changing context and strategy, but the CG system as well [18]. This dynamic change could even cover the board composition, number of directors, decision protocols, or learning processes, but primarily it can be focused on organizational resources, where we define strategic change from a resource-based view as the “fundamental pattern of present and planned resource deployments” [67] (p. 25).

Regarding CG theories, this approach is closely connected to the resource-dependency theory. According to this, the main task of the directors is to reduce environmental uncertainty, by connecting the organization to external resources, suppliers, customers, policy-makers, and other social groups. Moreover, the goal is to reduce the power of others on the organization and increase its own power on others [32]. This theory is often applied in case of board composition, i.e., those directors are preferred who can ensure connections to critical resources, information, or legitimation. These critical resources, however, might change with time, so a dynamic approach is required [68].

Based on the above, the theoretical framework puts emphasis on the role of the board in strategic adaptation and the board behavior regarding changing resource-based constraints and opportunities. Considering the different definitions of CG, this study is less concerned about the framework of rules, relationships, systems, procedures, and processes [69,70] among managers, directors, shareholders, and other stakeholders [71]; the exercise of power [72]; or finding the best decision procedures [73]. Instead, this study interprets CG as the highest-level system through which companies are directed and controlled [74], to create a balance between economic and social goals [75] (cf. sustainability) and the survival of the company [76]. For this purpose, the focus is on the tasks of the board of directors; e.g., strategy formulation (or its support) [77]; internal control [21]; evaluation of the management and influencing managerial behavior [78]; providing connections to resources and networks [79]; planning CEO succession and CEO selection [80]; and ensuring compliance with moral, legal, financial, and performance standards [81]. Integrating these consensual tasks from the literature, with the grouping of [21] and the dynamic capabilities framework from [43], Table 1 summarizes the theoretical framework with propositions for required dynamic capabilities that orient the empirical data collection and analysis.

Table 1. Propositions for empirical research (own construction, considering the arguments of [21,33]).

Propositions for . . .	Temporal Focus		Contextual Focus
	Present (Short-Term)	Future (Long-Term)	
Required dynamic capabilities (1)	Sensing legal, business, financial, and social risks	Sensing strategic opportunities and risks	(1) External environment
Examples for general tasks (1)	Ensuring accountability: evaluating audit reports, communication with shareholders	Participation in strategy formulation: initiating strategy analyses, interpretation of analyses, consulting with management	
Required dynamic capabilities (2)	Sensing organizational, operational risks Seizing strategic opportunities and managing risks	Allowing and facilitating transformation	(2) Internal environment
Examples for general tasks (2)	Monitoring and intervention (if needed): evaluating business results, management performance, resource utilization, and potential reconfiguration opportunities	Modifying, shaping policies: accepting financial plans, shaping the management incentives, reviewing risk management system, investment decisions about building new capabilities	

Based on the qualitative methodology of this study, hypotheses should not be defined, but—according to the abductive approach—a presumption may be defined that can orient the data collection and the data analysis. Based on the theoretical propositions of Table 1, the integrated presumption helps in finding the best explanation for the identified phenomena [82]; thus, it can be extended theoretically based on the empirical data [83]. By synthesizing the dynamic CG-related propositions with the sector-specific literature (presented in Section 2.1), and according to the research question, the following research presumption could be defined:

Dynamic CG in the context of the ESG projects of energy companies can be interpreted as the board capability to (1) sense and seize legal, business, financial, social, organizational, operational, and strategic opportunities and risks, (2) to seize the opportunities and manage these risks, moreover, (3) allow and facilitate transformation accordingly in the organization, to increase the financial and innovative performance of the firm and improve stakeholder relations.

3. Materials and Methods

3.1. Research Setting and Data Collection

This research is built on a qualitative methodology. Even though qualitative studies had been receiving less attention in certain traditional research areas, including energy, sustainability, and CG research, the number of qualitative studies is growing. Numerous qualitative studies have recently been published in different areas of sustainability research (e.g., agriculture [84], corporate sustainability and reporting [85], and sustainability education [86]), and also on topics similar to this research (CSR and competitive advantage [87], COVID-19 challenges for companies [88], and ESG [89]). Regarding concrete methods in sustainability research, qualitative content analysis [90,91] and case studies at smaller [58] and larger companies [92] have also been published recently.

By conducting a qualitative study, the empirical research goal was to validate, modify, and extend the theoretical propositions and the presumption of the research question [93], by conducting case studies at larger and smaller energy companies. More specifically, the authors conducted a multi-case study research at four companies with local operations in Hungary that collaborated on ESG projects. Both collaborations involved one innovative technology developer startup and one large energy company. The main data of the companies, the project description, and details about the data collection are presented in Table 2. Due to confidentiality, the number of employees and board members are presented

with intervals. The two startups and the two established companies, however, have similar organizational characteristics.

Table 2. Research context and data collection.

	Collaboration A		Collaboration B	
	Startup A	Incumbent A	Startup B	Incumbent B
Status	Operations only in Hungary	European multinational company	Operations only in Hungary	European multinational company
Main activities	ICT development (knowledge management system/KMS), project management system, artificial intelligence/AI development)	Electricity producer, energy trader, and energy provider	Power-to-X (P2X), carbon capture and utilization (CCU) technology developer	Electricity producer and trader, natural gas trader, system operator
Examples for ongoing sustainability-related initiatives	Specializing in AI-based knowledge management for the energy sector	Renewable electricity production, E-mobility, waste management	Developing technologies for energy storage, green gas production and decarbonization	Renewable electricity production, environmental protection programs (e.g., waste management, water quality management)
Number of employees	10–20	>500	5–10	>900
Corporate governance structure	One-tier 3 directors	Two-tier 3–7 directors in the executive board 3–7 members in the supervisory board	One-tier 3 directors	Two-tier 3–7 directors in the executive board 3–7 members in the supervisory board
Supporting ESG	Indirectly by AI-based digital technology		Directly by breakthrough energy technology	
Short project description	Developing unique KMS with sector-specific AI, in order to explore and utilize organizational knowledge for innovative, renewable energy projects		Planning the up-scaling of power-to-gas (P2G) technology at different commercial sites. The project involved a potential financial investor that was not specialized in the energy sector.	
Time horizon of the case studies (focus of the analyses)	2019 Q2–2020 Q3		2019 Q2–2021 Q4	
Data collection methods	<ul style="list-style-type: none"> - Document analysis (meeting memos, board reports, project documentation, ca. 200 pages) - Semi-structured interviews with executive directors (8) 		<ul style="list-style-type: none"> - Document analysis (meeting memos, board reports, project documentation, ca. 150 pages) - Semi-structured interviews with executive directors (10) 	

In line with Hungary’s traditional CG system, which is related to the continental, stakeholder-based (or “bank-based”) configuration of German origin [21,94], the larger companies have a two-tier governance structure with an executive board and a supervisory board. In these cases, the theoretical framework (Table 1) is interpreted as the shared responsibility of the two boards, but the research put emphasis on the executive board, which usually has more power over strategic decisions [95].

In both cases, the time horizon of the analysis was 2019–2021, and the COVID-19 pandemic affected the ESG projects as an environmental trigger for dynamic changes. These changes, their consequences, and the induced board interventions are the central topics of the case studies.

3.2. Data Analysis

The authors followed the extended case study [96] as the methodological framework for this research, which has been successfully used several times for researching dynamic capabilities [96–99]. It has an iterative, abductive approach, with in-depth analysis of a company. Iteration and abduction mean that the researchers compared empirical data with theory, and they reinterpreted data multiple times. The goal of the process was to generate theoretical constructs that fit the empirical data [83,99]. Thus, the extended case study can be seen as a balancing tool between positivist and interpretive research positions [100]. In line with this balancing, to enhance the systematic process of the iteration (and, thus, the reliability of the study), the authors also applied a rather inductive and functionalist qualitative data analysis method.

1. The authors conducted a qualitative content analysis [101], to understand the situation inductively, which oriented the further data collection (e.g., interview questions).
2. The coding technique of the grounded theory was used, based on Strauss and Corbin [102], which is a more functionalist and well-structured approach and allows the use of categories from existing theories.

Table 3 shows the data analysis processes and the actions used to improve generalizability, reliability, and validity.

Table 3. Research phases and data analyses.

	Method	Description	Research Sub-Questions	Followed Methodological Suggestions
Framework	Extended case study	In-depth analysis of a company with a longer time-horizon and iteration between theory and data	- What changes did boards of directors face and generate during the ESG projects? (SQ1)	[83,99]
Phase 1/Data analysis technique 1	Qualitative content analysis	<ol style="list-style-type: none"> 1. Preparing the data 2. Defining the unit of the analysis 3. Developing coding scheme 4. First-round coding 5. Testing the coding scheme and fine-tuning 6. Coding all the documents 7. Assessing coding consistency 8. Drawing conclusions from the coded data 	- What was the situation, what were the challenges? (SQ2) (Inductive understanding based on the negotiations)	[101]
Phase 2/Data analysis technique 2	Grounded theory coding technique	<ol style="list-style-type: none"> 1. Open coding 2. Axial coding 3. Selective coding 	- How did/could the boards intervene to handle challenges? (SQ3) (abductive theory generation)	[102]
Phase 3		<ol style="list-style-type: none"> 1. Synthetizing conclusions from the two case studies 2. Validating conclusions with interviewees via email 	Fine-tuning conclusions	
Improving generalizability, reliability, and validity		<ol style="list-style-type: none"> 1. Building theoretical framework based on the literature with theoretical triangulation (corporate governance and strategic management literature) 2. Data triangulation and methodological triangulation 3. Taking field notes and theoretical notes, and using them for abductive theory generation 4. Conducting multiple case studies (with different contexts), to enhance external validity 5. Reaching theoretical saturation, interviews are in line with literature samples [97,99] 6. Asking for feedback to improve construct validity 		[103,104]

Reflecting on qualitative research ethics, the authors faced fewer potential dilemmas in the organizational research context, compared to the potential ethical issues in other research areas, such as healthcare, drug use, or crimes [105]. Nevertheless, the authors had to balance consistency and flexibility [106], if an organically emerging (unplanned) interview question made the interviewee uncomfortable. This may have happened when the question was concerning sensitive financial aspects of the project, regarding which the interviewee did not have a clear right to disclose information. The second important ethical issue that must be mentioned is the interpretation of verbal and nonverbal signals by the researchers, which might be incorrect [107] and might create career risks for the participant. To avoid this problem, the authors asked follow-up questions, did not share the individual answers of the interviewees with the other participants, however, sent the synthesis of the answers (conclusions) to them for validation.

4. Results

The key findings of the case studies are presented separately, showing answers for the sub-questions (SQs) of the research (presented in Table 3) about the changes that boards of directors faced and generated during the ESG projects (SQ1), including challenges (SQ2) and interventions (SQ3). Answers to sub-questions are compared to and iterated with previous literature findings, to abductively answer the main research question in the Section 5.

4.1. Collaboration A

4.1.1. Inter-Organizational Board Conflict and Unbalanced Power Relations (SQ1–2)

In case of the KMS (knowledge management system) development project, the COVID-19 pandemic generated significant concerns in the executive board of Incumbent A during 2020 Q1–Q2. There was a shared concern about not taking the necessary steps in time and any significant delay of decisions affecting the organization directly. Consequently, two main goals were prioritized in the subsequent months:

- (1) optimizing processes in the administrative areas, focusing on how “home office” could be efficient (e.g., reconfiguring individual task groups, modifying reporting routines) to meet the standards of public health, but also efficient operations;
- (2) acceleration of new ESG (primarily environmental) project planning (e.g., extending e-mobility infrastructure) to show the adaptive capacity to the owners, and

“... become the winner of the uncertain times.”—Chairman of Incumbent A

While these strategic goals might have looked attractive for the organization, they generated significant conflicts between Incumbent A and Startup A. Both strategic goals affected the requirements of the ongoing KMS development. The background of this conflict was that only the main technology specifications were identified during the system planning phase of the project, while the lower-level needs were planned to be explored and satisfied with an agile development methodology. Based on the strategic importance of the KMS development, executive directors were directly involved in the negotiations from both sides, not only middle managers. Given the startup’s lesser “power”, i.e., its weak bargaining position, startup directors had to mobilize additional resources (software developers) over the planned budget, to meet the deadlines and the requirements.

Even though modifications resulted in a KMS that, indeed, supported the goals of the incumbent, the qualitative content analysis showed that continuous negotiations hampered the process regarding the functions that should have been developed or that preferably would have been integrated into the KMS (see Appendix A, Table A1). Interviewees from the startup side argued that the main challenge was the “radical” change of the incumbent itself, as well as the development requirements. Moreover, it was very difficult to coordinate the continuous and escalating incremental development needs after the first change of direction. Nevertheless, directors of the incumbent argued that further organizational changes that affected the KMS development were obviously unplanned (one director has left the top management team) but necessary (structural change because of the personal change, and a new unit became the project sponsor with a new director).

4.1.2. The Role of Strategic Foresight and Networks (SQ3)

Based on the above, the organizational changes entailed serious challenges for the startup, and these challenges were mainly about “mobilizing overplus resources” to meet the changing requirements of the sustainability-oriented KMS development. Meanwhile, the capacities of the startup company were tied up in other projects. Thus, one key pillar for meeting this challenge was the broad social network of the startup directors, through which they were able to quickly involve other ICT companies in the project (i.e., developers, without a formal recruitment process). The other key pillar was the strategic foresight of the startup CEO, who suggested in the beginning that the senior developers build a modular structure, which could later be configured during the agile sprints:

“In the case of such high-volume and complex development projects, I usually prefer to build core modules with basic functions that can be combined later. Until this time, this left space to reconfigure and reuse modules for different purposes. It requires more time in the beginning but saves time and costs later. Surprisingly, this modular structure also provided the opportunity later to handle the changing needs by quasi-outsourcing” (CEO of Startup A)

The different organizational changes of the incumbent and key success factors of the project (the startup board intervention) are summarized in Table 4, based on interviews. After numerous negotiations, the development officially ended in 2020 Q2, but some fine-tuning tasks were undertaken in the next quarter, in the framework of a KMS support service.

Table 4. Sensing risks, and using inter-organizational networks for adaptation.

Incumbent		Project	Startup	
Examples for Organizational Changes	Characteristics	Affected System Function	Critical Success Factor on Board Level	Implementation on the Professional Level
Operative policies	Incremental, once	Structures and contents of forms Database-structure New module for collaboration	-	-
Task groups Internal power relations (authorization) Changes in human resources, new project sponsor unit	Radical, once	Structure and content of AI-support and standard reports Ad hoc reporting platform for knowledge property, network, and utilization Modified functions of AI-support	Strategic foresight, sensing the risk of the complex development	Building a modular system, reconfiguring the modules
Operational processes	Incremental, multiple times	Permissions for actions Data communication among organizational units, sites, and with “legacy” systems	Using the inter-organizational network	Involving other companies (developers) quickly

4.2. Collaboration B

4.2.1. Value Creation Opportunities and the Perceived Risks of Innovation (SQ1–2)

In case of the power-to-gas (P2G) project, there had been ongoing but very slow negotiations between Incumbent B and Startup B, since 2019, after Startup B developed its biomethanation P2G (power-to-methane, P2M) prototype, in 2018. As this technology is considered one of the key solutions of the future energy sector, but as commercial-scale implementation would require millions of EURs, the executive board of Incumbent B was fully engaged in discussions about potential investment. Moreover, the investment decision also involved an international venture capital fund, for which Incumbent B was a guarantor for the promising strategic investment opportunity.

At the beginning of the negotiations, the opportunities offered by the technology seemed to be attractive enough to invest in the business plan. In 2020, after the COVID-19 pandemic outbreak, in-depth discussions related to investment risks became more emphasized during the meetings. Unlike in Collaboration A, there was no conflict, but a disagreement could be identified about the weighting of risks against opportunities (see Appendix A, Table A2). This meant that Startup B aspired to accelerate the process of becoming first-mover in the region in partnership with Incumbent B, even offering gradual up-scaling in line with the lessons from international projects. In contrast, Incumbent B slowed down the planning, mainly because of a lack of regulatory frameworks that would ensure much lower risks for the investment.

4.2.2. The Importance of Stability, Dividing but Convergent Roads (SQ3)

Based on the interviews, there was much more behind the deceleration of the planning than the missing regulatory frameworks. The changes caused by COVID-19 in the

macroeconomic environment increased the importance of stability and cautious financial actions, as well as also increasing the perception of risks for Incumbent A, as . . .

“ . . . this company is one of the key players of the energy sector in the CEE region. We have vast responsibilities, we cannot bear any financial risks that can be avoided. This applies to innovation, as well.”—Member of the Executive Board of Incumbent B

Even though the personal connections between the two companies (and management of the venture capital fund) were maintained, formal negotiations ended in 2021 Q1, indefinitely. However, the challenges described above, in the 2021 Q1–Q4 period, provided interesting insights into what happened next. As Startup A was also negotiating with other energy companies, the board explored the increasing need for carbon capture technologies, especially because of the growing carbon prices in the EU-ETS. Consequently, the board initiated a new technology development at prototype level for carbon capture, and a demonstration of the technology at lab-scale had already happened in 2021 Q4.

“The development of the Carbon Capture prototype is an important step towards the commercial-scale implementation of the P2G technology as well. P2G and Carbon Capture together will provide a cost-effective Carbon Capture and Utilization solution for industrial companies with flue gas emissions.”—Director of Startup B

In contrast, Incumbent B engaged in a more mature, less innovative, but also less risky, technological direction: development of power-to-hydrogen (P2H) technology. In fact, P2H is the step before methanation in the P2G value chain. Accordingly, even though Incumbent B and Startup B did not continue the planning of the P2G plant (“dividing roads”), both sides made advancements that eventually provided a new opportunity for a more promising collaboration (“convergent roads”). This means that Incumbent B has already implemented a green hydrogen production plant on a commercial-scale, and this can be combined with the Carbon Capture technology of Startup B to produce clean synthetic natural gas (SNG, mainly CH₄) from (surplus) hydrogen and CO₂ captured from the flue gas, e.g., from the gas-fired power plants of Incumbent B (Figure 1).

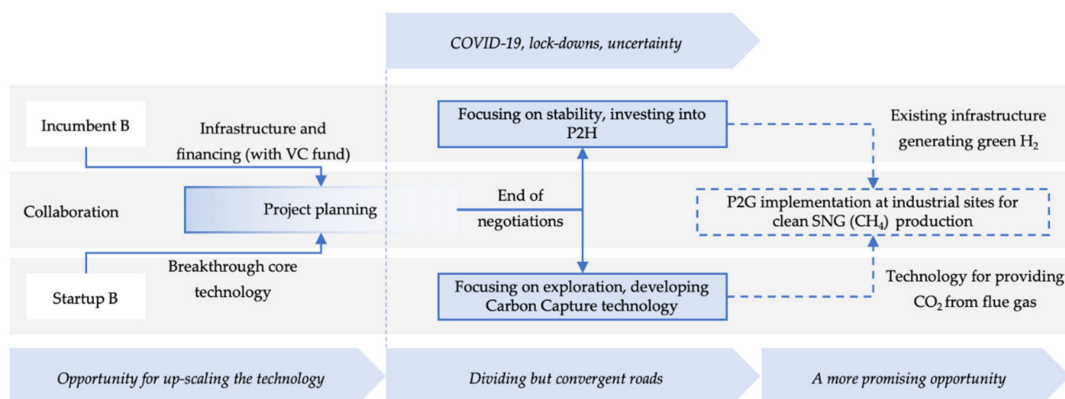


Figure 1. Visualization of Collaboration 2.

5. Discussion

5.1. Comparison of the Results of ESG and COVID-19 Research

An in-depth analysis of the ESG projects, focusing on the effects of rapid environmental changes (COVID-19), highlighted factors that reinforce or extend prior research results. First, regarding the energy sector, the results are in line with [108], who conducted a systematic literature review on CSR in this sector and found that energy companies follow a responsive or proactive CSR approach. This study reinforces this finding in the case of inter-organizational collaborations, as there was a responsive and a proactive company in both cases. In Collaboration A, Incumbent A aimed to accelerate its renewable energy-based project planning, despite the pandemic, and Startup A had to adapt to the changes;

while in Collaboration B, Startup B was proactive regarding scaling-up the technological innovation, but Incumbent B chose a responsive approach, because of the perceived risks and the importance of stability. In line with [36], lessons from Collaboration B show that large energy companies should calculate with significant investments, to generate more green energy, but they may choose a careful financing approach and a more mature core technology in the first step, which also directly supports sustainability. In contrast, this observation does not apply to the indirect support of sustainability in case of Collaboration A, where developing an AI-based knowledge management technology for new project planning remained a priority during the pandemic, with the ambition of gaining a competitive advantage from it later. This approach is similar to the conclusion of [10], according to which investing in ESG practices is beneficial for companies in the long run, as sustainable practices have a significant positive effect on firm value, through wealth maximization and value creation.

While some studies analyzed ESG- and renewable energy-based investments from the outside, from an investor perspective [11,109], and others, from casual relationships with a quantitative approach, in-depth, qualitative case studies draw attention to novel factors. Similarly, CSR-related CG research often considers the quantitative attributes of boards of directors, CSR reporting, and financial outcomes. For example, [7] found that a higher proportion of non-executive directors and/or female directors led to higher CSR performance; [37] pointed out that having more independent directors or declaration of audit committees affects the performance of Indian utilities; and [110] highlighted corruption risks that hamper sustainable energy development. A similar approach applies in the broader sustainability research area. For example, [111] found that foreign shareholding, institutional shareholding, board independence, and board size increase total sustainability disclosure, while [112] argued that, along with auditing firms, the existence of remuneration committees within a company also increases the likelihood of CSR disclosure. These considerations can be supplemented by the results of this study, because, with a different, abductive approach, this study found an increased relevance of the conscious directing of (1) organizational changes (see Incumbent A), (2) innovation (see Incumbent B and Startup B), and (3) inter-organizational networks (see Startup A) at CG level, to foster sustainability in a dynamically changing environment.

Given the impact of COVID-19 on the global economy and companies, scholars have already published novel results, which can be extended by this study. First, [113] argued that the COVID-19 pandemic offers a unique possibility for CG studies to examine what changes can be made that allow firms to either prevent or respond to possible future events. Thus, the authors defined important questions on five key areas, in relation to future crises, including the characteristics and processes of boards of directors. While their questions imply dynamic changes within the board, e.g., restructuring attributes, diversity, length and number of meetings, and supporting the management, the results of this study, instead, direct attention toward other areas where board-level processes and interventions might be fruitful: organizational changes, innovation, and inter-organizational networks. This is a more strategic management-based and instrumental approach regarding “good corporate governance”; for example, compared to the research of [114], who explored the impact of COVID-19 in the U.S. on firm-level stock behaviors and the mitigating effect of corporate governance (board and ownership structures) and key policies used to tackle the COVID-19 pandemic. It was concluded that good corporate governance could help to mitigate the negative effects of COVID-19 on stock price volatility and trading volume, but it may help alleviate the impact of COVID-19 on stock returns. Nevertheless, the results of this study reinforce the conclusion of [115], that a firm’s ability to adapt to changes in the external environment (COVID-19) might be hindered by a rigid and strict CG framework. The argument of this study, however,—through a strategic viewpoint—goes beyond the “traditionally” considered CG factors, such as board size, gender diversity, a link between CEO compensation and shareholder return, or CEO duality.

Regarding the intersection of ESG and COVID-19, the results of this study are in line with the findings of [116], which highlight the importance of environmental governance during a time of crisis, as firms with a better environmental governance scheme experienced more efficient investments after the outbreak. As seen in Collaboration A, Incumbent A aspired to accelerate renewable-energy based project planning to represent the adaptive capability of the organization for the owners.

5.2. Interpretation of Dynamic CG Based on the Theoretical Iteration

Based on the theoretical iteration with the CG literature, the three key factors identified (networks, innovation and change) are supported by the CG literature focusing on dynamic adaptation:

- a. In case of organizational changes, intervention in case of low performance [117], conflicts about mergers and acquisitions [20], changing the strategy and the board composition and behavior [18], CEO risks taking and its effects [118], institutional conflicts influencing CSR [22], and responsible actions after misconduct [23] have appeared recently as important research areas.
- b. Regarding organizational innovation, determining innovation goals and risk tolerance [15], managing agency risk [119], facilitating responsible innovation [120], and directing CEO attention [121] are key topics.
- c. Considering inter-organizational networks, acquisitions [122], directing knowledge flows and knowledge defense [123], network actions, building or cutting connections [124] in balanced and unbalanced network structures [125], using board interlock networks [126] and strategic partnerships [125], and imitating exploitation or exploration [127] are the main goals of CG.

Table 5 shows a validation of the propositions regarding the potential dynamic capabilities at board-level, based on the empirical results. Regarding the roots of dynamic CG, from the perspective of directorial change, to access new resources in a new environment [18,53,68], only one example was observed for director-level changes in Collaboration 1. Even though it was not directly (explicitly) connected with the new resource needs, as the new director became the leader of the project sponsor unit, his personal skill set, at least, might have been more appropriate for the acceleration of the development.

Table 5. Propositions and validating empirical data with new insights.

Focus	Present (Short-Term)	Future (Long-Term)	Validation
Required dynamic capabilities and tasks regarding the external environment	Sensing legal, business, financial, and social risks (e.g., ensuring accountability: evaluating audit reports, communication with shareholders)	Sensing strategic opportunities and risks (e.g., participation in strategy formulation: initiating strategy analyses, interpretation of analyses, consulting with management)	Propositions
	Incumbent B: Wait and see approach in case of breakthrough innovation with high CAPEX and uncertain business model (P2M) Startup A: Identifying danger of not meeting the needs of Incumbent A because of the organizational changes	Incumbent A: Accelerating renewable-energy project planning with AI-based KMS aimed at innovation Startup B: Identifying the opportunity in the network for another innovation (CC)	Empirical examples

Table 5. Cont.

Focus	Present (Short-Term)	Future (Long-Term)	Validation
Required dynamic capabilities and tasks regarding the internal environment	Incumbent A: Realizing organizational changes (directorial and structural) and using bargaining power against Startup A Startup A: Using the inter-organizational network to handle operational risks of work overload Startup B: Developing a new technology to support the commercialization of the core technology	Incumbent A: Initiating organizational changes as an answer for the new environmental conditions Incumbent B: Implementing a more mature technology first (P2H), which can be combined later with a more innovative one (P2M)	
	Sensing organizational, operational risks Seizing strategic opportunities and managing risks (e.g., monitoring and intervention (if needed): evaluating business results, management performance, resource utilization, and potential reconfiguration opportunities)	Allowing and facilitating transformation (e.g., modifying, shaping policies: accepting financial plans, shaping the management incentives, reviewing risk management system, investment decisions about building new capabilities)	Propositions

Finding these CG factors (sensing different kinds of opportunities and risks, seizing opportunities, managing risks, and allowing and facilitating transformation) using empirical research represents a novelty in the energy sector. The single similar research result from the energy sector was published by [25], arguing for the importance of decision maker networks (including other firms and institutions such as universities), their reconfiguring abilities, and internal knowledge sharing, to foster sustainability and adaption to changes. Based on the iteration with the theoretical framework that interconnects CG and strategic management theories (resource-dependency theory with the resource-based view of the firm; dynamic board behavior with dynamic capabilities), Figure 2 extends the findings from board-level (Table 5) to CG level. One of the most important theoretical extensions, compared to the dynamic capabilities framework, is that empirical data validate the relevance of sensing, not only opportunities, but risks concerning ESG projects at the CG level. Moreover, the figure illustrates that there is a continuous interplay between the environment and the organization, according to the resource-based view. This means that environmental phenomena (e.g., COVID-19) or trends (e.g., ESG investment) determine the required behavior of the company, but a breakthrough sustainable innovation (organizational performance) can also affect the environment. From the perspective of resource-dependency theory, one could argue that accessing missing resources (through networks) and combining them with others in a new way (initiating organizational change) could reduce environmental uncertainty and lead to the increased power on other entities (e.g., licensable innovation).

Based on recent literature, these findings could have several implications, not only for (energy) companies, but their different stakeholders as well. For example, a key topic is whether or not ESG ratings can capture companies that are characterized by their capacity for generating higher values for stakeholders [128]. While ESG indices cannot be used as an indicator of value creation for stakeholders [128], the results of this study show that the growing importance of ESG ratings could incite boards of directors to facilitate projects that are, indeed, beneficial for stakeholders, especially for the natural environment in the energy sector.

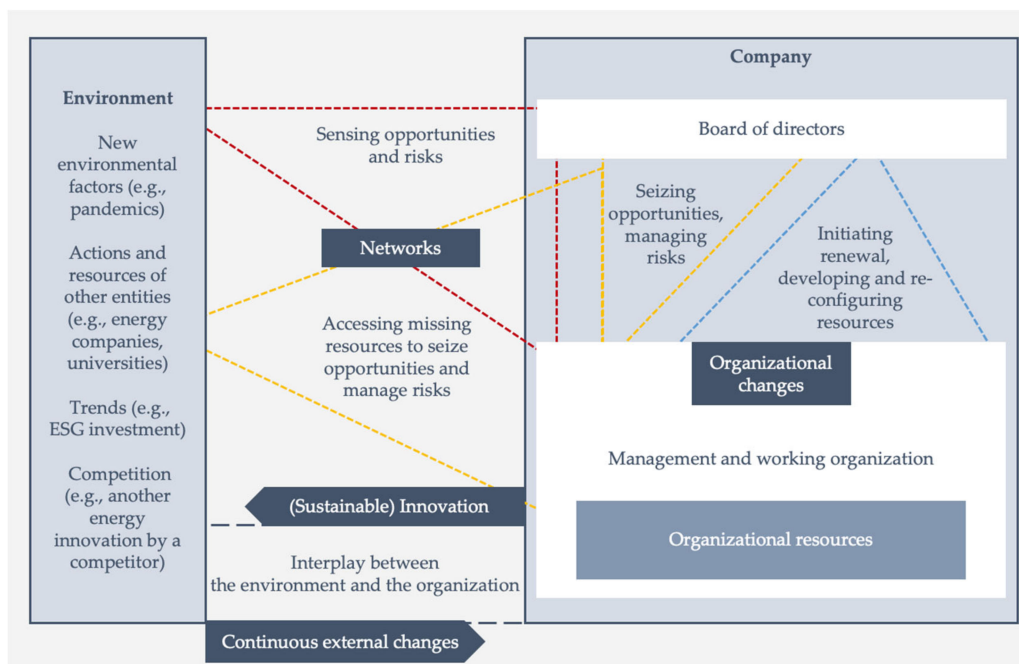


Figure 2. The role of organizational changes, innovation, and inter-organizational networks in dynamic CG, focusing on sustainability (own construction, considering the arguments of [33]).

Another interesting aspect of ESG initiatives is that institutional investors are increasingly prioritizing sustainable development and environmental protection. In this regard, [129] assessed the role of the corporate site visits of institutional investors on corporate governance mechanisms related to sustainability, and argued that these site visits could significantly decrease the likelihood of environmental violation, and increase the environmental investment of the firms. Extending this argument, the findings of this study suggest that the scope of institutional investors' activities can also involve an analysis of the capability of the boards to facilitate organizational change, reliably decide about innovation directions, or extensively use their inter-organizational networks to improve ESG performance.

Compared to the initial theoretical propositions, the findings highlight that, not only organizational changes (i.e., allowing and facilitating transformation), but innovation activities and inter-organizational networks, could also be the subject of board interventions to adapt to rapidly changing environmental conditions. Concerning the resource-dependency theory from the aspect of innovation and inter-organizational networks, the connections of boards to stakeholders and potential partners with complementary resources could be crucial to achieving innovation goals. These connections could be built and used, for example, in an innovation ecosystem with heterogeneous actors [130]. The relevance of these innovation networks and combining the capabilities of different actors (e.g., industrial actors, academia, investors) has already been presented empirically; for example, in the case of the power-to-gas industry [131].

6. Conclusions

This study focuses on a novel CG research direction in the context of sustainability. Theoretical propositions of dynamic CG are formulated based on the integration of the dynamic capabilities and the literature regarding the tasks of the board of directors, based on which a presumption was defined for the research question. The propositions and the presumption were analyzed at larger and smaller energy companies. These companies collaborated on ESG projects, but these projects were significantly affected by the COVID-19 pandemic. The results reinforce the relevance of sensing, not only opportunities, but different kinds of risks at CG level. The presumption, however, should be extended, as

the results highlighted the role of board intervention, not only in organizational changes, but in innovation and inter-organizational networks, in order to adapt to rapidly changing environmental conditions.

The theoretical contribution of the study is that it elaborates the theoretical opportunities of an emerging new CG approach (dynamic CG), to fill in the research gap of the overlooked strategic viewpoints of ESG and sustainability-related CG research. By doing so, CG theory, the resource-dependency theory, and a strategic management approach, as well as the resource-based view of the firm, are integrated. Furthermore, the research gap of studying CG mechanisms at startup companies in the sustainability research area is also partly filled in. Regarding the methodology, one important contribution of the study is that it broadens the (low but growing) number of qualitative studies in the sustainability and CG research area and presents how the abductive approach could be applied by the combination of interpretative and functionalist methodological elements to extend theory (extended case study method, qualitative content analysis and grounded theory coding technique). The practical contribution of the study is that it provides insights into two collaboration projects with different incumbent and startup companies and applies a novel CG research approach to sustainability in the energy sector, where usually financial and CSR reporting aspects are dominant. The practical implication of the findings is that it might help other boards how to manage (breakthrough) innovation, initiate organizational changes and use inter-organizational networks to foster sustainability in a rapidly changing environment. Finally, the industry-specific conclusion of the study is that realizing collaborative technology developments might be hampered by different interests of partners when external conditions change which also influence sustainable transitions. In Hungary, the first case showed that only the high adaptation capability of the startup saved the project from failure, while in the other case, it was only a matter of luck that the divergent development roads during the downtime of the project led to a more promising opportunity. Thus, the open, dynamic, and socially responsible behavior of the boards of collaborative energy companies are crucial to ensure the realization of long-term sustainable goals even when short-term changes challenge the financial expectations of these projects.

One main limitation of the study derives from the applied methodology that can result only in a substantive theory. Consequently, theoretical findings are valid only in the given context but can serve as a guide for new working hypotheses of future quantitative studies. These quantitative studies might focus on a larger sample of companies as this study analyzed only the cases of four companies with a qualitative approach. Moreover, theoretical propositions of the dynamic CG could be validated or further elaborated in other contexts, and/or from other CG theoretical roots. Finally, regarding the short and specific study period, future studies could extend the time horizon to compare the board behavior before and after the COVID-19 pandemic appeared and (hopefully) mostly disappeared as a serious societal and economic challenge.

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Appendix A

Table A1. Inter-organizational negotiation practices among directors in Collaboration A (based on qualitative content analysis).

Topic	Organizational Changes and Required AI-Based KMS Functions			
Category	Initial Organizational Changes		Further (Ongoing) Organizational Changes	
Incumbent A directors' communication patterns	Omitting to mention		Mentioning occasionally	
Startup A directors' communication patterns	Accentuation		Mentioning frequently	
Code/Sub-category	Implemented function	Un-implemented function	Imperfect function	Unplanned, unimplemented function
Comment	All the developed functions, not only the planned ones in system requirements	It was a system requirement but is not developed	Developed functions which are unsatisfactory based on incumbent perception	Not planned in the system requirements, and is not developed
Incumbent A directors' main messages	It was a fundamental requirement, not relevant anymore	Obligatory to implement	Wrong functions	Urgent request
Startup A directors' main messages	Needed additional resources to implement	Already compensated	To be fine-tuned	Opportunity for further development
Incumbent A directors' phrases	-	"handling the problem of the missing function"	"actual errors" "annoying errors" "how could it be corrected?" "wrong messages and notifications"	"actual topic" "function that increases user experience" "truly missing function" "it would be nice, if..." "another way is..." "it could be seen..."
Startup A directors' phrases	"mobilizing overplus resources" "fits the new business needs" "generated additional resource need" "fully new" "not specificated" "redesigning" "redevelopment"	"it was not an initial need" "it should not have been working this way"	"adaptation" "fine-tuning" "almost ready"	"future development goals" "modification request" "request for extension"

Table A2. Inter-organizational negotiation practices among directors in Collaboration B (based on qualitative content analysis).

Topic	Investing in the Up-Scaling of the P2G Technology			
Category	Opportunities		Risks	
Incumbent B directors' communication patterns	Recognizing strategic fit to the portfolio		Focusing on high CAPEX of commercial-scale implementation	
Startup B directors' communication patterns	Demonstrating R&D&I results and discussing future benefits		Underlining the risk of missing the opportunity to be first-mover in the region	
Code/Sub-category	Environmental adaptation by innovation	Socio-economic and environmental value creation	Legal environment affecting business model	Technological risks and site selection affecting business model

Table A2. Cont.

Topic	Investing in the Up-Scaling of the P2G Technology			
Category	Opportunities		Risks	
Comment	P2G drives renewable energy integration and provides long-term energy storage [132,133]		There is no specific regulation for P2G in Hungary, but it is planned. Potential biomethane feed-in-tariffs and/or reduced electricity system usage fees, etc. can significantly affect the business model [134].	Sector coupling by P2G is possible if there is a connection to the natural gas grid. Attractive financial results can be generated by direct connection to a solar park. A biogas plant might be an ideal site by converting the CO ₂ of the biogas into methane [135].
Incumbent B directors' main messages Startup B directors' main messages	No question that P2G is the future Scaling up gradually is possible	The volume of the decarbonization potential There is an opportunity for decarbonization	Wait and see approach Be proactive, shape the environment	Complexity of the infrastructure Know-how is available, trends are favorable
Incumbent B directors' phrases	"P2G is promising" "We see the importance of the technology" "Fit the trends"	"How many tons of CO ₂ ...?"	"First wait and see the future conditions" "We have to be careful and patient"	"Infrastructural limitations of the sites" "Additional investments" "Optimization of an extended technological infrastructure" "Questions for reducing the time of return"
Startup B directors' phrases	"Disruptive technology" "Modular configuration"	"Helping decarbonization" "Reusing carbon dioxide" "Producing green gases"	"International project developments had several phases before commercial-scale implementation" "Must take steps ahead to keep pace with international trends" "Demonstration in the relevant environment is impactful for policymakers"	"Decreasing capital expenditures" "International projects have been finished, lessons have been learned" "Hungarian R&D background is existing with universities and research centres"

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