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## Research Article

# A Surge toward a Sustainable Future: Organizational Change and Transformational Vision by an Oil and Gas Company

O Despontar de um Futuro Sustentável: Mudança Organizacional e Visão Transformadora em uma Empresa de Gás e Petróleo

Tahrir Jaber<sup>1</sup>

## ABSTRACT

**Context:** reflecting the call being made by the United Nations to solve our current climate challenges and reduce companies' CO<sub>2</sub> emissions, there is a strong need for large corporations to not only employ the terminology of sustainable transitions, but to implement strategies and select new alternative sustainable solutions. **Objective:** this study fills a gap in the literature by developing and validating a model that helps researchers understand the factors that enable a large corporation undergoing a sustainable transition to select its new sustainable practices. The developed model used theories of sustainability transition and institutional theory with three pillars (regulative, normative, and cognitive) in order to help understand the nature of the company's innovation selection criteria. **Method:** survey-based research was carried out among an oil and gas company's employees, and structural equation modeling was used to test the model fit, validate the survey, and test the hypotheses. **Results:** the results showed that normative and regulative pillars play the main role in selecting renewable energy activities as a first step toward the company's sustainable future. **Conclusion:** the findings provide researchers with a valuable model for understanding the main criteria for selecting new sustainable projects in established companies.

**Keywords:** sustainable transition; innovation selection; oil and gas industry; renewable energy; institutional theory; organizational culture.

## RESUMO

**Contexto:** como reflexo do chamado das Nações Unidas para que se busquem soluções para os desafios climáticos atuais e se reduza a emissão de CO<sub>2</sub> pelas empresas, há uma grande necessidade de que as grandes empresas não apenas empreguem a terminologia referente à transição para a sustentabilidade, mas também implementem estratégias e adotem soluções alternativas sustentáveis. **Objetivo:** este estudo preenche uma lacuna na literatura ao desenvolver e validar um modelo que ajuda os pesquisadores a compreender os fatores que permitem a seleção de novas práticas sustentáveis no âmbito de uma grande empresa em transição para a sustentabilidade. O modelo desenvolvido utilizou teorias de transição para a sustentabilidade e a teoria institucional com três pilares (regulativo, normativo e cognitivo) para ajudar a compreender a natureza dos critérios de seleção de inovação da empresa. **Método:** realizou-se uma pesquisa do tipo survey junto a funcionários de uma empresa de gás e petróleo, e realizou-se uma modelagem de equações estruturais para testar o ajuste do modelo, validar a pesquisa e testar as hipóteses. **Resultados:** identificou-se que os pilares normativos e reguladores exercem o papel principal na seleção das atividades de energia renovável como um primeiro passo da empresa em direção a um futuro sustentável. **Conclusão:** os resultados fornecem aos pesquisadores um modelo valioso para a compreensão dos principais critérios para a seleção de novos projetos sustentáveis em empresas estabelecidas.

**Palavras-chave:** transição para a sustentabilidade; seleção de inovação; setor de gás e petróleo; energia renovável; teoria institucional; cultura organizacional.

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## INTRODUCTION

We have moved into a world where the environment, with its natural resources, is becoming endangered due to the growth of emissions (Wenzel & Alting, 2004). This has led international organizations and political efforts to meet problems like climate change, in addition to finding solutions and encouraging people to change (Molcho & Shpitalni, 2006). The United Nations (UN), for example, is working toward a goal to limit the average global temperature to no more than two degrees Celsius (United Nations, 2016). This has forced companies to change their environmental engagement and invest in sustainable activities (Miras-Rodríguez, Domínguez-Machuca, & Escobar-Peréz, 2015).

In particular, many companies have considered sustainability as a management tool that identifies the company's position in relation to sustainable development (Baumgartner, 2003). For example, researchers report that integrating sustainable strategies into overall business can bring several benefits: triggered innovations that are efficient in the use of resources, development of new environmental markets, improved corporate image, product differentiation, enhanced competitive advantage, and economic growth (Porter & Van der Linde, 1995; Shrivastava, 1995). However, meeting climate objectives requires technological and organizational changes in business activity (Molcho & Shpitalni, 2006). This growing interest in sustainability calls for more research to better understand how sustainability is developed in companies (Binz, Harris-Lovett, Kiparsky, Sedlak, & Truffer, 2016; Kishna, Niesten, Negro, & Hekkert, 2017).

Integration of sustainability in companies has been extensively studied. For example, it has been found that sustainability adoption occurs when employees support corporate efforts to move toward a more sustainable future (Frandsen, Morsing, & Vallengtin, 2013). Markard, Raven, and Truffer (2012) have also found that sustainability transition requires different actors and interests to make sustainability part of the company. Furthermore, Daneshpour and Takala (2016) indicate that renewable energy (RE), social satisfaction, efficiency improvement, and innovation are the key drivers to achieve sustainability. However, Kudratova, Huang, and Zhou (2018) indicate that there is still a lack of quantitative studies concerning sustainability project selection. Consequently, this paper fills the lack of quantitative studies and aims to explain how an established company selects its sustainable, innovative projects to meet global environmental challenges.

The world today faces fundamental sustainability challenges in several areas, energy supply being one of them (International Energy Agency [IEA], 2017). The oil and gas (OG) sector, for example, is challenged by social and

environmental pressures to engage with low carbon energy transition. This has forced OG companies to move toward a cleaner market and invest in RE. However, given that RE is outside the core business of OG companies, this requires such companies to gain legitimacy in order to meet the expectations of different stakeholders such as employees, suppliers, customers, investors, and society as a whole (Fisher, Kotha, & Lahiri, 2016; Jawahar & McLaughlin, 2001). Thus, companies in transition are required to include changes in user practices, technological and institutional structures (Markard, Raven, & Truffer, 2012). At the same time, selecting a new sustainable project is a difficult process especially for established companies in transition. Thus, this paper uses institutional theory and its three pillars: regulative, normative, and cognitive, as a tool to understand how people in established companies make their sustainable choices and aim to perceive these choices as legitimate internally.

This study creates a measure of a company's innovation selection that helps us understand how a new sustainable culture in an established company is maintained. Thus, this topic is explored by addressing the following research question: How does an established company manage its sustainable transition? This question contributes to existing literature by employing a quantitative empirical approach and developing a questionnaire for how the idea of innovation selection is reviewed. Thus, this paper is structured as follows: First, relevant literature on institutional theory and sustainability are reviewed. Second, theoretical background, theoretical model, and hypotheses are provided. The article continues with a description of research methodology, testing of the model, followed by the results and discussion. Finally, conclusions, limitations, and directions for future research are provided.

## THEORETICAL FRAMEWORK AND HYPOTHESES

In this section, streams of literature are reviewed that are of major relevance to this study, namely sustainability, institutional theory and innovation selection. This helps develop the theoretical framework, understand how an established company manages its sustainable activities, and create hypotheses that will be tested later in the study.

### Sustainability: principles and practices

The concept of sustainable development has been raised since the introduction of the Brundtland report in 1987 as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (United Nations, 1987). Sustainability

in this study is seen as a commitment that enables an established company to develop new clean alternatives and aims to achieve new perspectives such as social and environmental development, rather than focusing on economic gains.

Previous research indicates that studies on sustainability have expanded rapidly (Caprar & Neville, 2012; Freeman & Soete, 1997; Grin, Rotmans, & Schot, 2010; Khalili-Damghani, Sadi-Nezhad, Lotfi, & Tavana, 2013; Markard et al., 2012). For example, Kemp (1994), Kemp, Schot, and Hoogma (1998), and Schot, Hoogma, and Elzen (1994) have investigated the factors that have led companies to develop new sustainable regimes, while others were concerned with examining how companies manage transitions toward sustainability. In addition, Markard et al. (2012) highlight that relatively little effort has been made concerning sustainable transition, especially within the domains of management studies such as sustainable transition initiatives and sustainable project selection criteria.

Furthermore, other researchers have considered clean innovation as one of the core drivers for sustainable shifts in industry, focusing mostly on innovation systems and the link between societal and technical regimes (Markard et al., 2012). Other researchers highlight that sustainability transition is a narrow field that needs more in-depth quantitative studies concerning how this transition could be undertaken in practice and how a sustainable strategy process is measured (Engert, Rauter, & Baumgartner, 2016; Kudratova, Huang, & Zhou, 2018; Musiolik, Markard, & Hekkert, 2012).

As a result, Galbreath (2009) and Hahn (2013) show that some companies still find it difficult to integrate sustainability into business strategy and there is a need for more research concerning how companies select their sustainable projects. Therefore, in order to fill the lack of research, this study follows an OG company that is experiencing a major period of transition (low oil price and climate challenges) and aiming to introduce RE practices into its business. This would create uncertainty in the OG company, which is aiming to invest heavily in alternative, cleaner sources of energy and adapt new technologies in their production in order to meet sustainable measures and standards. The next section introduces a viable theoretical framework and hypotheses developed to answer the research questions of this paper.

## Theoretical model and hypotheses

### *Sustainability transition*

Researchers like Tushman and O'Reilly (2002) indicate that organizations demand change and renewal when new modes of innovation demand it. This allows organizations to respond quickly to market change and secure

their survival and growth (Tushman & O'Reilly, 2002). This paper focuses on a sustainable change that happens in an OG company. Sustainability transitions can be defined as “long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption” (Markard et al., 2012, p. 956). Sustainability transition, in this study, is viewed as an introduction to a sustainable shift (RE) in an OG company and is seen as a long-term goal of the company's overall strategy, as indicated in Table A1.

Researchers show that there is a rapidly growing amount of literature in the field of transition studies (Markard et al., 2012). This includes studies such as infrastructures and transitions (Loorbach, Frantzeskaki, & Thissen, 2010), the transformation of the energy system (Schreuer, Rohrer, & Späth, 2010), and actor strategies (Farla, Markard, Raven, & Coenen, 2012) in addition to studies to address environmental problems in companies and which aim to explore new commercial opportunities related to new technologies (Smith, Stirling, & Berkhout, 2005).

New sustainable innovations do not offer user benefits, but they do offer a collective good that scores lower on price than established technologies (Geels, 2011). This makes it difficult for companies to replace existing technologies without changing their company policies and regulatory framework (Geels, 2011). This also demands changes in their institutional systems, organizational culture, and technological configurations (Gaziulusoy & Ryan, 2017; Loorbach, 2010).

In addition, Tushman and O'Reilly (2002) show that managing organizational change requires a strategic imperative that is reflected in organizational culture, structure, and practices. For instance, researchers like Selznick (1957) have developed institutional theory that aims to study how organizations shape their structures in relation to the commitments of their participants and external parties. In addition, Orji (2019) identifies the sustainable drivers and barriers that might enhance or block sustainability transition in companies. Other researchers such as Michaelides, Bryde, and Ohaeri (2014) have studied management experience and its effect toward investing in sustainable activities. Therefore, this study presents a theoretical model and defines the main factors that would influence an established OG company to select its sustainable projects as shown in Figure 1.

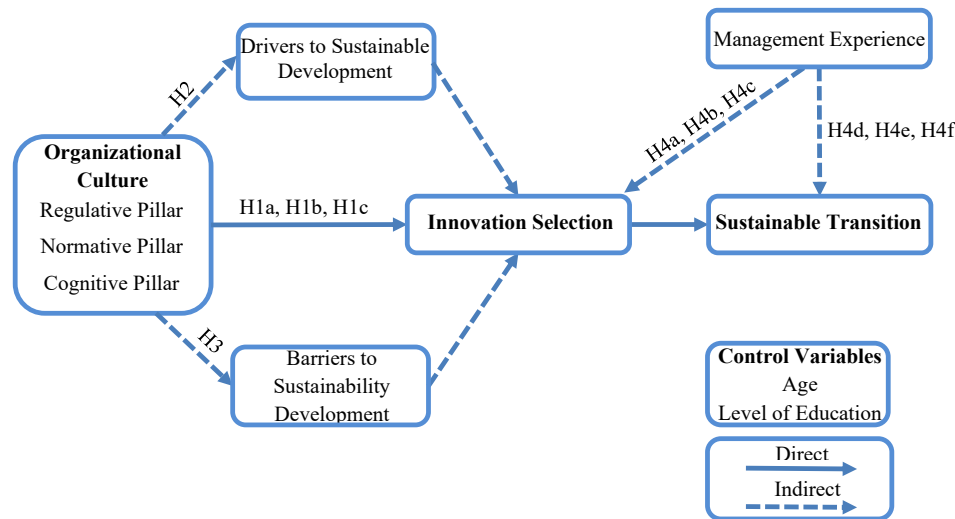


Figure 1. A theoretical framework.

The factors in Figure 1 include sustainable transition (dependent variable) that depends jointly on innovation selection (another dependent variable) and the organizational culture (independent variables). Consequently, the ambition of this paper is to enrich the existing theoretical basis of sustainability transition research and organizational culture.

However, a core challenge toward moving into sustainable solutions in an OG company is faced when producing a new business activity that is not perceived as a core activity. Yusuf et al. (2013) claim that studying how an OG company reacts toward a sustainable change remains an under-researched field of inquiry. Therefore, it is interesting to understand how a sustainable innovative project is selected.

In this account, the central factor of the developed model (Figure 1) is the company's innovation selection. Innovation selection is assumed to capture the main factors (three institutional pillars, drivers, and barriers) that enable the company to select its sustainable, innovative projects.

### Direct hypotheses: innovation selection

The field of innovation is very broad; authors like Kimberly (1981, p. 85) focus on the difference between 'diffusion' and 'adoption' of innovation; additionally, Van de Ven and Rogers (1988, p. 636) make the distinction between studies of 'innovating' and 'innovativeness.' This study focuses on the adoption of 'clean innovations' in an established OG company in order to examine what enhances or hinders the company's innovation selection criteria.

Literature in innovation selection was started in the 1960s and covered areas such as uncertainty, degree of risk

and research, and development and innovation projects that are needed to understand the decision-making process (Bin, Azevedo, Duarte, Salles-Filho, & Massaguer, 2015). However, Kudratova et al. (2018) and Solak, Clarke, Johnson, and Barnes (2010) argue that literature is limited in the innovative project selection issues, due to the fact that it is difficult to capture the whole concept of project selection in addition to the complexity of integrating new sustainable solutions in the company's routines.

Selecting a sustainable project is essential in order to obtain expected outcomes, maintain competitiveness, or increase a company's value (Kudratova et al., 2018). In addition, the innovation selection criteria should cover important needs for users, provide expected profitability for the company, improve brand image, conquer new markets, and function effectively (Yannou, Zimmer, Farel, Jankovic, & Cardinal, 2013). Other researchers like Payne, Bettman, and Johnson (1988) claim that the project selection approach looks at costs, efforts required, and benefits that enable a company to select the best alternative choice.

In addition, researchers like Burgelman have confirmed that the internal selection mechanism is linked strongly to the overall strategy that aims to maintain and gain control over the company's destiny (Burgelman, 1991, 2002). This way, the internal selection environment deals with the overall corporate strategy, competition, competence, and strategic action (Burgelman & Siegel, 2008). Thus, the internal selection environment is essential to help a company align its strategic action.

Furthermore, companies adopt innovations in order to respond to either technological or market challenges (Brenner, 1987; Gomes-Casseres, 1996; Gomes-Casseres,



1994; Hage, 1988; Smith, Grimm, & Gannon, 1992). For example, in OG companies, there are no definite answers concerning the selection of RE sources (wind, hydropower, solar energy, geothermal energy, or bio energy). Selecting an RE case is not simply about the finished product or its impact on society, but the whole physical life cycle of the RE case (technology used, location, competences, long-term strategy, and profit).

According to the case company of this paper, sustainability is embedded in the overall strategy that aims to provide low carbon energy. However, the sustainable innovation selection mechanism has become a multi-criteria decision-making problem, and is derived to satisfy the company's overall strategy. Thus, in this paper, innovation selection is seen as a project that will be within the core strategy, covered by the company's competence, representing an interesting market, serving the top manager's interests, achieving a high profit and positive environmental/social profile, as listed in Table A1. However, the adoption of innovation in an established company requires a change in its internal environment — for example, the structure and functioning of the company (Damanpour, 1991). This requires activities that help facilitate the adoption of innovation and putting it into use (Damanpour, 1991). At the same time, the required activities to initiate and implement the innovation are different in each organization (Marino, 1982; Zaltman, Duncan, & Holbek, 1973; Zmud, 1982). This opens new perspectives in organizational research, including the issues of institutional change (Bell, 1974; Hage & Powers, 1992) and the integration of micro-level analysis in companies (Hage, 1999).

Thus, institutional theory, in this paper, plays an essential role in analyzing rules, norms, and routines that leads the company to achieve specific goals (sustainable transition, in this study) (Scott, 2014). Institutional theory also provides a comprehensive theoretical lens that helps understand different attitudes and practices in a particular social context (Scott, 1995a; Scott, 2014).

### *Direct hypotheses: Institutional pillars*

An organization can adopt a new idea or behavior that is new to the organization (Daft & Becker, 1978; Damanpour, 1988, 1991; Hage & Aiken, 1970; Oerlemans, Meeus, & Boekema, 1998; Zaltman et al., 1973; Zammuto & O'Connor, 1992). This study takes an OG company as an example of a large corporation that adopted clean innovations that are new to the company and outside its core business. This sustainable change introduces new technologies to the OG company and leads to its transformation from only OG to mixed-energy. This concept is interesting because it changes the institutional embeddedness of the company and the internal attitudes toward that change. This allows us

to understand how the employees perceive this change and select new sustainable projects.

Sustainable transition in companies is complex and there is profound disagreement between researchers on how to investigate such a transition (Geels, 2011). Geels (2011), for example, called sustainable transition a 'socio-technical regime' that aims to achieve long-term changes by struggling against existing regimes. The socio-technical regime includes rules such as cognitive routines, shared values, competences, user practices, and institutional arrangements and regulations (Geels, 2011). The socio-technical regime aims to capture different regimes so that companies can adjust their cultural, political, and industrial dimensions in order to adopt new technologies (Geels, 2004, 2011).

Institutional theory assumes that organizations change due to external forces; however, organizational culture deals with these changes internally in order to undergo new changes and secure the company's internal legitimacy (Barley & Tolbert, 1997; DiMaggio & Powell, 1991; Pedersen & Dobbin, 1997, 2006; Scott, 2014). Thus, institutional theory and its three pillars are used in this article in order to examine the role culture plays during a change and how this culture affects the company's sustainable choices. Thus, understanding the relationship between a company's culture and selecting new sustainable technologies can provide greater insight into the organization undergoing change.

In addition, this paper focuses on the employees' sustainable choices due to the fact that employees have an essential influence on the implementation process (Zammuto & O'Connor, 1992) and that the greatest innovation challenges might come from them (Tushman & O'Reilly, 2002). In other words, a change in an organization requires changing a culture that occurs at the internal levels in a company (Kondra & Hurst, 2009).

Thus, the three institutional pillars, regulative, normative, and cultural-cognitive, help us understand how a company undergoes new change, how employees make choices, and the extent to which their choices are rational (Marx, 2014). First, the regulative pillar is associated with the regulatory processes that involve the capacity to establish new laws and rules in order to influence future behavior (Scott, 2014) and advance an individual's interest (Marx, 2014). The regulative pillar emphasizes the importance of maintaining and changing institutions (Scott, 2014). Thus, the regulative pillar, in this paper, focuses on employees' perceptions of new policies and goals developed by the OG company that lead to a sustainable transition, as listed in Table A1. By this, it is hypothesized that:

Hypothesis 1a — The regulative pillar strengthens the effect of innovation selection on sustainable transition.

Second, the normative pillar is associated with both values and norms. Values are perceptions of preferred or desired standards to which existing behaviors can be compared and assessed; however, norms involve shared behavior that specify how things should be done (Scott, 2014). Values and norms are not predictions; they are prescriptions used to understand how the company's employees are supposed to behave (Scott, 2014). Thus, the normative pillar in this paper involves a measure of the employee's self-evaluation that acts as a stabilizing influence on the social beliefs and norms that are considered morally appropriate and correct, as listed in Table A1. By this, it is hypothesized that:

Hypothesis 1b — The normative pillar strengthens the effect of innovation selection on sustainable transition.

Third, the cultural-cognitive pillar involves shared conceptions that create the nature of social reality, and build the frames that make this meaning possible. By this, Scott (2014) believes that institutions should take the cognitive dimensions of human existence by dealing with the external world of stimuli and the reaction of individual organisms. Thus, the cultural-cognitive pillar explains how a company's employees respond to the world around them (Turner, 1974; Ventresca & Mohr, 2002). Thus, the cultural-cognitive pillar in this paper plays a central role in connecting the companies to the external environmental problems and challenges them to build sustainable knowledge and solve

such environmental problems by engaging in new sustainable practices, as listed in Table A1. By this, it is hypothesized that:

Hypothesis 1c — The cognitive pillar strengthens the effect of innovation selection on sustainable transition.

### Mediation hypothesis: drivers/barriers

In addition, the proposed model in Figure 1 explores the role that drivers/barriers play in enhancing or blocking the sustainability effort by an OG player. Miras-Rodríguez, Domínguez-Machuca, and Escobar-Peréz (2015) claim that there is limited quantitative research discussing the impact of drivers and barriers on sustainability activities adopted by companies. However, Orji (2019) summarizes the studies (mostly qualitative) that identify the drivers and barriers that might enhance or block sustainability in companies. On one hand, Orji (2019) identifies drivers as governmental regulation, promoting sustainable products, developing infrastructure support, etc. On the other hand, Orji (2019) identifies the barriers as inefficient legal framework, inadequate proactive plans, lack of employee welfare, etc. Furthermore, Table 1 helps reveal a clear picture of the overall impact of mediating institutional theory on innovation selection and sustainable transition.

**Table 1.** Moderation and mediation studies in sustainability.

Literature	Outcomes variables	Moderator	Mediator
Gabzdylowa, Raffensperger, and Castka (2009)	Personal values, preferences, satisfaction (i.e., enjoyment of the work itself), product quality, and customers' demand.	Size of the involved companies	Sustainability drivers
Bjørner, Hansen, and Russell (2004); Haigh and Jones (2006); Marshall, Cordano, and Silverman (2005); Tullberg (2005)	Managerial attitudes, employees' demands, organizational culture, internal pressure on business managers, and social development activities.	-----	Sustainability drivers
Luthra, Govindan, and Mangla (2017)	Management support, governmental policies and regulations, gaining the market edge, and improving the overall performance.	-----	Drivers to sustainable consumption and production adoption
Thomas-Seale, Kirkman-Brown, Attallah, Espino, and Shepherd (2018)	Education, cost, software, materials, mechanical properties, validation, and finishing.	Industrial manufacturing companies	Barriers to the progression of technologies government and policy makers are interested in
Trianni, Cagno, and Neri (2017)	Economic barrier and resistance to change (lack of information and other priorities).	Manufacturing firms	Barriers that hinder sustainable implementations
Aboelmaged (2018)	Organizational drivers, environmental pressure, and competitive capabilities.	Small and medium-sized industries	Drivers to sustainable manufacturing practices
	More sustainability awareness.	Experience of project managers	-----
Hind (2009)	Responsible leadership (integrity, open-minded, ethical behavior, care for people, and managing responsibility outside the organization).	Leadership sustainable skills	-----
Robinson (2006)	Environmental issues, social issues, and financial issues.	Managers' knowledge toward promoting sustainability in companies	-----

This paper views sustainability drivers as customer expectations, green strategy, internal requirements, corporate culture, knowledge of sustainability, use of new technology, development of new technology, return on investment (ROI), demand from investors, and reputation of the firm. However, barriers are viewed as lack of: financial funds, competence and capabilities, employee motivation, technology, support from top-management, ROI, and perceived importance. The list of drivers and barriers are listed in Table A1.

Consequently, it is hypothesized that:

Hypothesis 2 — Drivers mediate the positive effect of the regulative, normative, and cognitive pillar on innovation selection.

Hypothesis 3 — Barriers mediate the positive effect of the regulative, normative, and cognitive pillar on innovation selection.

### *Moderation hypotheses: management experience*

Finally, managers are becoming aware of the need to satisfy social and environmental issues, thus, they play an essential role in selecting a specific sustainable project and in driving their companies toward sustainability. In addition, investing in sustainable projects has increased dramatically in the business world, where companies realize the importance of emphasizing social and environmental goals in their companies (Bansal, 2005; Global Reporting Initiative [GRI], 2011; Hoffman, 1999). Researchers have found that management experience increases the awareness of sustainability and, thus, more experienced managers are able to drive sustainability into the company's activities (Michaelides, Bryde, & Ohaeri, 2014). Furthermore, Table 1 helps reveal a clear picture of the overall impact of moderating institutional theory on innovation selection and sustainable transition.

Therefore, it is hypothesized that:

Hypothesis 4a — Management experience strengthens the positive effect of the regulative pillar on innovation selection.

Hypothesis 4b — Management experience strengthens the positive effect of the normative pillar on innovation selection.

Hypothesis 4c — Management experience strengthens the positive effect of the cognitive pillar on innovation selection.

Hypothesis 4d — Management experience strengthens the positive effect of the regulative pillar on sustainable transition.

Hypothesis 4e — Management experience strengthens the positive effect of the normative pillar on sustainable transition.

Hypothesis 4f — Management experience strengthens the positive effect of the cognitive pillar on sustainable transition.

## RESEARCH METHOD

In order to examine the selection criteria of sustainable projects and test the above hypotheses, this section describes the survey developed for this study, defines its empirical context, and describes and analyses the dataset.

### *Oil and gas industry toward renewable energy*

The world faces a change in the energy industry and moves toward electrification in order to tackle the climate challenges we meet today. Gielen, Boshell, Saygin, Bazilian, Wagner, and Gorini (2019) show that RE provided 14% of the global energy sources in 2015 with an expectation of this growing very fast in the future. This put the OG industry under risk and forced it to reduce its OG production (Dale & Fattouh, 2018; Eser & Stansbury, 2018).

This challenges OG companies to introduce new, clean energy activities to their businesses, such as RE. In particular, RE has received significant attention as a means to improve environmental activities for commercial use, and is found to be a new promise to the world's future energy (Bayer, Dolan, & Urpelainen, 2013), due to its low environmental impact and low energy costs.

Thus, the context of this study is the OG sector. With its current sustainable shift toward RE, it presents an ideal setting to understand how an OG company selects its sustainable activities. However, introducing RE technologies to a pure OG company adds complexity to its organizational processes. This requires the company to enhance its capabilities by adapting knowledge and competencies outside its boundaries. The case company of this paper presents a well-established European OG producer; however, as a strategic response to the climate change and growth in the RE market, it managed to enter the RE market and shift the company from purely OG to a broad energy major. This paper focuses on the company's employees who have an essential role in introducing new sustainable ideas to their management team, as will be explained next.



## Data description and procedure

This quantitative paper has been developed from a survey conducted between 2017 and 2019. Part of the data was used in another article, mainly the institutional pillars (regulative, normative, and cognitive) and sustainable transition as shown in the dataset description by Jaber and Oftedal (2019). The article was published in *Sustainability Journal* by Jaber and Oftedal (2020) and aimed to understand the factors that legitimize the adoption of renewable energy activities in an oil and gas company. The survey was undertaken in English as well as the local national language of the country where the company is located. A sample of 113 respondents participated in this study, where 90 respondents fully completed the survey. The 93 respondents filled out the survey through a self-administered web survey (SurveyMonkey). In addition, 20 respondents filled out a paper-based survey. The respondents who participated in this survey were mainly employees working in a sustainability unit, business development department, and corporate strategy unit, and engineers who understand the new sustainable shift that is taking place in the company. Most respondents (43%) were between 41 and 55 years old and 37% were between 26 and 40 years old. Slightly more than half of the sample's members were men (52%). In addition, 74% of the respondents had management experience and 83% had experience within the energy field.

To check conduct validity and correct any ambiguities, steps by MacKenzie, Podsakoff, and Podsakoff (2011) were followed. In the first step, the survey was developed and refined by the author and another researcher where a large pool of items was derived from institutional theory by Scott (1995b; 2014). The survey was then pre-tested with twelve experts — six academic experts and six employees from the case company. Thus, the company's contact person distributed the final version of the survey, as shown in Table A1, through the company's internal network. In the second step, the survey was evaluated and the model was validated, as will be described in the next section.

The survey in Table A1 shows the three independent variables that were derived from institutional theory. The regulatory pillar includes five items that focus on the company's regulations, policies, and incentives that aim to drive a sustainable change in the company as a whole. The normative pillar includes five items that focus on employees' contributions and expectations in order to measure their role in achieving the company's sustainable goal. Finally, the cognitive pillar involves four items that aim to measure sustainability knowledge and acceptance among employees.

In addition, the survey presents two dependent variables. First, transition toward sustainability includes four items and focuses on the new sustainable goals that the company aims to achieve. Second, innovation selection involves seven items that present the strategic decisions criteria to be taken into consideration before selecting a sustainable project. More information about the items can be shown in Table A1.

Finally, the survey presents two mediators that aim to measure the indirect effect of the interaction of institutional pillars on sustainable transition through innovation selection. First, drivers include ten items that aim to test whether there is any issue that would push the company to adopt sustainability in its agenda. Second, barriers involve seven items that aim to measure if there is any issue that would prevent the company from adopting sustainability in its agenda. Table A1 indicates the relevant items used in this study.

The survey consists of a seven-point Likert scale (ordinal variables) because it works better with educated samples (Weijters, Cabooter, & Schillewaert, 2010). The Statistical Package for Social Sciences (SPSS) and analysis of moment structures (AMOS) were used as statistical software in this study. Thus, structural equation modeling (SEM) was applied as a key diagnostic to measure the direct and indirect effects in the developed model and determine the model fit, reliability, and validity of the model (Sijtsma, Straat, & van der Ark, 2015). The next section describes in detail how the data have been analyzed.

## DATA ANALYSIS AND RESULTS

Before analyzing the data, data screening of 113 respondents was undertaken. This resulted in 90 fully completed responses. This is due to excluding 22 respondents who had missing values, in addition to one unengaged respondent who gave the exact same response for every single item. In addition, four variables with less than 5% missing were replaced by the median (ordinal variables) and one variable was replaced by the mean (continuous variables). Furthermore, a skewness and kurtosis variable screening test was made where two abnormal variables were found: regulative (item 5) and sustainable transition (item 4).

The model developed in this study includes many different variables. Therefore, exploratory factor analysis (EFA) was made only for the dependent variable (sustainable transition) and the independent variables (regulative, normative, and cognitive) pillars. EFA helped regroup the variables into a limited set of items in order to better understand the relationships and patterns between variables (Yong & Pearce, 2013). In addition, when applying EFA,

maximum likelihood and promax rotation were selected because it is more useful when undertaking confirmatory factor analysis (CFA) in AMOS (Gaskin, 2016). As a result, the abnormal items (regulative 5 and sustainable transition 4) were taken into consideration and a decision was made

to drop them. Then, other variables were analyzed one by one and a decision was made to drop the problematic items, respectively cognitive 2, normative 5, transition 3, regulative 4, and regulative 1. The final pattern matrix table is shown in Table 2.

**Table 2.** Pattern matrix<sup>a</sup>.

	Factor			
	1	2	3	4
Cronbach's alpha	0.932	0.873	0.876	0.69
Regulative pillar 2			0.787	
Regulative pillar 3			0.979	
Normative pillar 1		0.541		
Normative pillar 2		0.605		
Normative pillar 3		0.994		
Normative pillar 4		0.720		
Cognitive pillar 1	0.635			
Cognitive pillar 3	0.954			
Cognitive pillar 4	0.919			
Transition 1				0.857
Transition 2				0.581

**Note.** Extraction method: maximum likelihood. Rotation method: promax with Kaiser normalization. a. Rotation converged in 5 iterations.

The pattern matrix table shows how the variables loaded significantly on each factor and represents the correlation between the variables and factors. The four-factor solution provided meaningful factors that reflected regulatory, normative, cognitive pillars and sustainable transition, explaining 73.67% of the variance. The Kaiser-Meyer-Olkin (KMO) test was 0.87 and the Bratlett's test was significant. However, Cronbach's alphas confirm an internal-consistency coefficient for the regulatory pillar (0.88), normative pillar (0.87), cognitive pillar (0.93), and sustainable transition (0.69). The rest of the variables will be analyzed one by one in the next section.

## Scale evaluation and validation

As mentioned earlier, the company allows its employees to present new business ideas to the top management team. This makes the responses of the survey valid and the next section shows how the theoretical model and its variables have been validated empirically in this study.

## Model fit

The SEM analysis method was used to perform a CFA that is essential to verify the factor structure that was extracted from the EFA (Gallagher & Brown, 2013). However, as this study presents a new model, common method bias (CMB) was applied to test the fit of the model by using a common latent factor (CLF) against the alternative one without the CLF (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). First, all variables from the EFA (institutional pillars and transition) in addition to the other variables (innovation selection, drivers, and barriers) were analyzed. The CFA was then applied and items that had loadings below 0.7 were dropped from the model. This presented a reduced model of 19 items (Normative 2,3&4, Regulative 2&3, Cognitive 1,3&4, Transition 1&2, Drivers 6&7, Barriers 2,3&4, Selection 1,2,3&4).

The CMB was then applied and a comparison was made between the unconstrained common method factor model to the fully zero constrained common factor model as shown in the chi-square test in Table 3 (Gaskin, 2018). The results showed a significant p-value, as shown in Table 3.

**Table 3.** Common method bias test results.

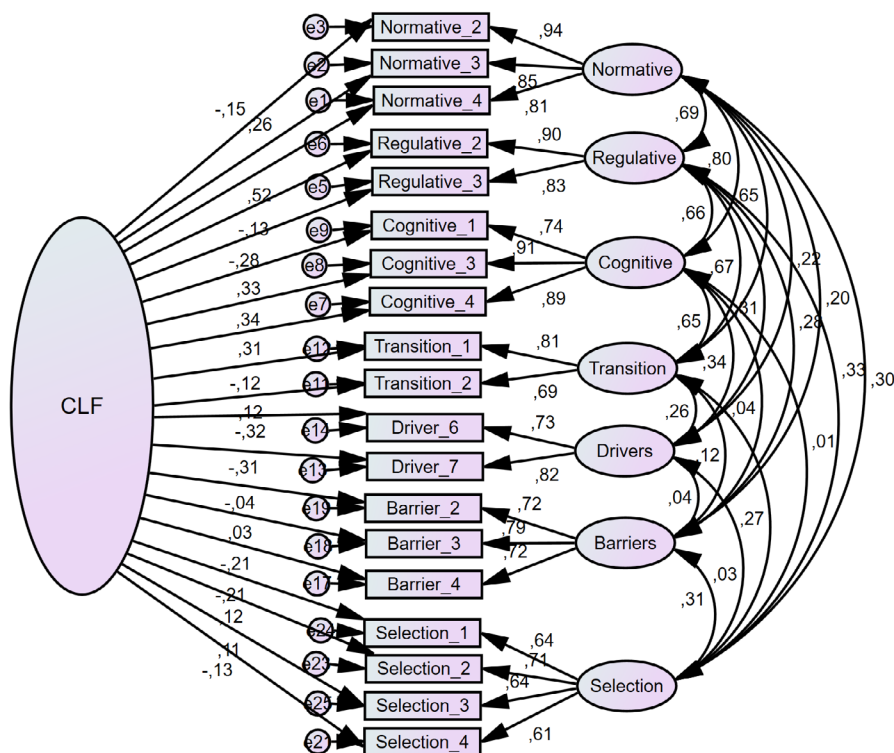
	Chi-square	df	p-value	Invariant?	
Overall model					
unconstrained	149.8	114			Step 1. Provide chi-square and df for unconstrained and constrained models, and provide the number of groups. The thresholds will be updated automatically.
Fully constrained	205.3	131			
Number of groups		2			
Difference	55.5	17	0.000	NO	Groups are different at the model level. Check path differences.

This result provided evidence that the actual model with the CLF model showed a better model fit (CFI = 0.964, RMSEA = 0.059, GFI = 0.864, and PCLOSE = 0.272) than the fully constrained model (CFI = 0.924, RMSEA = 0.08, GFI = 0.817, and PCLOSE = 0.015) as shown in Figure 2.

This study followed the measures by Hair, Black, Babin, and Anderson (2013) who suggest that the comparative fit index (CFI) is accepted when the values are between 0 and 1. Root mean square error of approximation (RMSEA) is accepted when the value is between 0.03 and 0.08 (Hair, Black, Babin, & Anderson, 2013). Goodness of fit index (GFI) is accepted when the value

is between 0 to 1 (Hair et al., 2013). However, Kenny, Kaniskan, and McCoach (2014) accept the p of close fit (PCLOSE) when it is greater than 0.05 (Kenny, Kaniskan, & McCoach, 2014).

Figure 2 shows a shortened scale of items with three normative, two regulative, three cognitive, two transition, two drivers, three barriers, and four selection. Thus, the CFA was performed on the 90 responses by adding the CLF in order to capture the common variance among all observed variables in the model. Subsequently, the final survey instrument consisted of 19 items as shown in Table A1 (text displayed in bold \*\*\*).



**Figure 2.** Confirmatory factor analysis results.  
(Unconstrained model where all the paths are constrained to zero)

**Table 4.** Correlation matrix.

	Selection	Barriers	Drivers	Transition	Cognitive	Regulative	Normative
Selection	1.00						
Barriers	0.38**	1.00					
Drivers	0.03	0.04	1.00				
Transition	0.32**	0.16	0.32**	1.00			
Cognitive	0.03	0.06	0.42**	0.74**	1.00		
Regulative	0.38**	0.31**	0.35**	0.77**	0.72**	1.00	
Normative	0.34**	0.23*	0.28**	0.74**	0.82**	0.75**	1.00

Note. \*\*, Correlation is significant at the 0.01 level (2-tailed). \*, Correlation is significant at the 0.05 level (2-tailed).

In addition, Pearson's correlations for all scaled variables are presented in Table 4. As predicted, 'selection' is statistically significant with barriers, regulative and normative, and 'transition' statistically significant with drivers, cognitive, regulative, and normative. However, to examine the direct effect among institutional pillars and selection and transition, and the indirect effect among driver/barriers and innovation selection, SEM was performed using the program AMOS, as will be described later in the study.

### Model validity

To validate a measure of a model in a reliable and valid manner, it is required to undertake some comprehensive validity assessments (Hair et al., 2013; Tracey & Tews, 2005). Thus, measuring reliability, convergent validity, and discriminant validity is essential to test how well the variables relate to one another. Table 5 uses a formula provided by Gaskin (2018) that automatically calculates the construct reliability (CR), average variance extracted (AVE), and maximum shared variance (MSV).

**Table 5.** Reliability and validity.

	CR	AVE	MSV	MaxR(H)	Barriers	Normative	Regulative	Cognitive	Transition	Drivers	Selection
Barriers	0.789	0.555	0.106	0.790	0.745						
Normative	0.903	0.757	0.689	0.914	0.156	0.870					
Regulative	0.881	0.788	0.448	0.891	0.296	0.583	0.888				
Cognitive	0.935	0.829	0.689	0.964	0.011	0.830	0.531	0.910			
Transition	0.713	0.554	0.448	0.719	0.128	0.590	0.669	0.607	0.744		
Drivers	0.828	0.708	0.127	0.863	0.061	0.092	0.357	0.163	0.259	0.841	
Selection	0.740	<b>0.417</b>	0.113	0.742	0.325	0.297	0.336	0.000	0.282	0.028	0.645

Note. Validity concerns. Convergent validity: the AVE for Selection is less than 0.50.

The CR was assessed for each variable in the model in order to measure the internal consistency of the variables (Hair et al., 2013) as shown in Table 5. This represents that all the measures meet the threshold suggested by Hair et al. (2013) ( $CR > 0.7$ ). Thus, this shows an excellent reliability and internal consistency. For the AVE, it is important in the SEM in order to determine which variables share a high proportion of variance (Hair et al., 2013). Table 5 shows that all the measures meet the threshold suggested by Hair et al. (2013) ( $AVE > 0.5$ ) except the variable 'Innovation Selection'. However, Malhotra and Dash (2011) argue that AVE is too strict, and reliability can be established through CR alone (which was achieved in this study).

In addition, external validity was performed by comparing the AVE measures to a paper published in the international conference on information systems (Hoerndlein, Benlian, & Hess, 2012). The mentioned study asked actors to rate the institutional influences concerning adopting green innovations that were outside the organizational context, on a five-point Likert scale survey. This shows that the regulatory pillar in this paper (0.79) correlated positively ( $p < 0.03$ ) to their regulatory pillar (0.82). In addition, the normative pillar (0.76) correlated positively ( $p > 0.11$ ) to their normative pillar (0.65). However, the cognitive pillar (0.83) correlated positively ( $p > 0.15$ ) to their cognitive pillar (0.68). In sum, these comparisons indicate a respectable correspondence between



this study's institutional measures and relevant variables from external sources.

Finally, the MSV was also measured in order to ascertain whether one measure is distinct from another measure (Hair et al., 2013; Tracey & Tews, 2005). Results from Table 5 show that the MSV is supported ( $MSV < AVE$ ) according to Hair et al. (2013).

These results show that the model developed in this study was validated empirically, and ready for testing.

### Testing hypotheses

Before testing the developed hypotheses, Cook's distance analysis and multicollinearity test have to be considered in this study. The Cook's distance analysis helped look at the influential points in the dataset and was made on each dependent variable against all the independent variables. Thus, no abnormal records were found in the Cook's distance analysis on 'selection.' However, one abnormal record was found when the Cook's distance

analysis was applied to the 'transition,' and a decision was made to keep the abnormal record because it was not very far from the other records.

Furthermore, a multicollinearity test helped predict the correlation between the independent variables themselves and with the dependent variables. Table 6 shows that the dependent variable 'selection' has no multicollinearity problems. Table 7 shows, also, that the dependent variable 'transition' has no multicollinearity problems. This is based on the threshold values by Hair et al. (2013), Kock (2015), and O'Brien (2007), where the tolerance should be greater than 0.1. In addition, a variance inflation factor (VIF) value should be less than 10 (O'Brien, 2007; James, Witten, Hastie, & Tibshirani, 2013). James, Witten, Hastie, and Tibshirani (2013) and O'Brien (2007) indicated that in practice a small amount of collinearity among independent variables is accepted and a VIF value that exceeds 10 indicates a problem.

**Table 6.** Multicollinearity test for 'Selection'.

		Unstandardized coefficients		Standardized coefficients		Collinearity statistics		
	Model	B	Std. error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.463	0.419		5.881	0.000		
	Barriers	0.074	0.052	0.130	1.428	0.157	0.810	1.234
	Drivers	0.036	0.082	0.041	.443	0.659	0.797	1.255
	Cognitive	-0.396	0.073	-0.897	-5.419	0.000	0.245	4.081
	Regulative	0.303	0.091	0.459	3.347	0.001	0.357	2.799
	Normative	0.471	0.110	0.693	4.279	0.000	0.256	3.904

**Table 7.** Multicollinearity test for 'Transition'.

		Unstandardized coefficients		Standardized coefficients		Collinearity statistics		
	Model	B	Std. error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.067	0.491		4.213	0.000		
	Barriers	-0.042	0.061	-0.047	-0.685	0.495	0.810	1.234
	Drivers	0.007	0.096	0.005	0.073	0.942	0.797	1.255
	Cognitive	0.164	0.086	0.240	1.912	0.059	0.245	4.081
	Regulative	0.457	0.106	0.448	4.307	0.000	0.357	2.799
	Normative	0.225	0.129	0.214	1.745	0.085	0.256	3.904

Subsequently, the general model takes the following equations:

$$Y = \beta_0 + \beta_1 * \text{Barriers} + \beta_2 * \text{Drivers} + \beta_3 * \text{Cognitive} + \beta_4 * \text{Regulative} + \beta_5 * \text{Normative} + \varepsilon$$

$$\text{Innovation Selection} = 2.5 + 0.07 * \text{Barriers} + 0.04 * \text{Drivers} - 0.4 * \text{Cognitive} + 0.3 * \text{Regulative} + 0.47 * \text{Normative} + \varepsilon$$

$$\text{Sustainable Transition} = 2.07 - 0.04 * \text{Barriers} + 0.01 * \text{Drivers} + 0.16 * \text{Cognitive} + 0.46 * \text{Regulative} + 0.23 * \text{Normative} + \varepsilon$$

As a result, the output results from AMOS show that the model explains 46% of the outcome data ( $R^2 = 0.46$ ). Furthermore, in order to test the indirect effects of the model, a plugin built by [Gaskin and Lim \(2018\)](#) was used in AMOS as shown in Table 8. Table 8 shows the standardized estimates of the direct and indirect effects. Thus, it indicates that H1a and H1b are significant and thus supported. H1c indicates a negative but statistically significant relation among cognitive and transition. This might be due to the addition of the two mediating variables (drivers/barriers). However, H2 and H3 are not significant and not supported by this study. This means that the data provides little or no evidence that the mediators (barriers/drivers) have an indirect effect on the model.

Furthermore, by using the Excel tool developed by [Gaskin \(2018\)](#), Figure A1 shows the results of the moderator's effect (management experience) on the model. This shows that H4b, H4c, H4d, and H4e are significant and supported; however, H4a and H4f are not

significant and not supported in this model. This means that management experience strengthens the relationship between the regulative pillar and innovation selection, strengthens the relationship between the normative pillar and transition, strengthens the relationship between the normative pillar and innovation selection, and strengthens the relationship between the cognitive pillar and transition. However, management experience weakens the relationship between the regulative pillar and transition and weakens the relationship between the cognitive pillar and selection.

Finally, the results show some non-significant effects on the hypotheses and, therefore, a post-hoc analysis is required. According to [Hair et al. \(2013\)](#) and [Loken and Gelman \(2017\)](#), a post-hoc test is valid when it is greater than 0.8. Thus, the post-hoc result for the dependent variable 'transition' gave a value of 0.875, and the post-hoc result for the dependent variable 'selection' gave a value of 1, meaning that the non-significant effects are valid in this study.

**Table 8.** The direct/indirect effects of the model<sup>a</sup>.

	Direct/indirect path	Unstandardized estimate	Lower	Upper	p-value	Standardized estimate
H2	Normative --> Drivers --> Selection	-0.011	-0.090	0.020	0.429	-0.016
H3	Normative --> Barriers --> Selection	0.032	-0.001	0.091	0.112	0.047
H1b	Normative --> Selection --> Transition	0.234	0.104	0.401	0.001	0.223***
H2	Cognitive --> Drivers --> Selection	0.012	-0.027	0.073	0.523	0.027
H3	Cognitive --> Barriers --> Selection	-0.034	-0.081	0.003	0.131	-0.076
H1c	Cognitive --> Selection --> Transition	-0.202	-0.301	-0.101	0.001	-0.296***
H2	Regulative --> Drivers --> Selection	0.007	-0.010	0.054	0.348	0.011
H3	Regulative --> Barriers --> Selection	0.042	-0.001	0.100	0.105	0.063
H1a	Regulative --> Selection --> Transition	0.161	0.067	0.301	0.001	0.158***

Note. a. \*\*\*  $p < 0.001$ , \*\*  $P < 0.01$ , \*  $P < 0.05$ , †  $P < 0.1$ .

## DISCUSSION

Selection of innovation criteria is difficult in companies because it requires listening to external

pressures, in order to make a decision that matches that external pressure ([Karlsson & Middleton, 2015](#)). This paper presents a case company from the OG sector that managed to shift its core business from pure OG into a

mixed-energy company. This shift was faced as a result of challenges and risks given that the company invested in alternative clean energy (RE) outside its core business. Therefore, this paper developed and validated a model that measures how an established company would select its sustainable projects.

Institutional theory and its core pillars (regulative, normative, and cognitive) provided deeper understanding of how an OG company selects its sustainable projects. Thus, the findings offer interesting insights into the literature on institutional theory and contribute to a richer understanding of the transition of companies toward sustainability as summarized in Table A2. The key findings of this study reveal that the regulative and normative pillars play an essential role in selecting sustainable projects that enables them to shape their sustainable future. For the regulative pillar, this means that employees believe in their management team and accept the company's contribution of shifting a pure OG energy player into a broad energy company. In addition, the normative pillar shows that employees believe in the company's sustainable transition; they see it as the way toward future opportunities and they are interested in moving the company toward sustainability.

On one hand, researches like [Drori and Honig \(2013\)](#) confirm that regulative and normative pillars play an essential role in framing organizational identity and shaping its strategic direction. The results show that the normative pillar presents the strongest factor in all pillars. This is not surprising because this paper focuses on selecting innovative sustainable projects and not on shaping its sustainable strategic direction. By this, the employees play the most essential role in selecting innovative sustainable projects and introducing them to the top management team. In this case company, the employees selected RE projects such as offshore wind energy projects that enabled them to use their skills, knowledge, and competences used in offshore OG projects. In addition, the results show that the regulative pillar plays an important role in shaping the company's sustainable transition, as confirmed by previous studies.

On the other hand, [Laïfi and Josserand \(2016\)](#) argue that the cognitive pillar would be automatically achieved when regulative and normative pillars are achieved in companies. The cognitive pillar in this study indicates that the employees have a good understanding of sustainability and they aim to find new ways to improve the company's sustainable goals. However, the developed hypothesis about a positive relationship between the cognitive pillar and the effect of innovation selection on sustainable transition was not supported. The results show that the cognitive pillar has a statistically significant but negative effect. The negative result was caused due to the addition

of mediating variables (drivers and barriers), and this means that as the cognitive pillar increases, sustainability transition decreases. In other words, this means that lack of knowledge about the company's sustainability leads to more investment in RE activities. This result could present some explanations: (1) The number of responses was not high according to the total number of the company's employees, thus increasing the sample size might change the result achieved. (2) Another explanation could be that the respondents who participated in this study were mostly employees who already have some knowledge about the company's sustainable transition than anyone else in the company. Thus, the participants in this study may be in search of new knowledge related to sustainable projects they wanted to introduce to the top management team. This result is not surprising in social science — for example, researchers like [Ofstedal, Iakovleva, and Foss \(2018\)](#) and [Oosterbeek, van Praag, and Ijsselstein \(2010\)](#) found a negative cognitive pillar effect on their studies.

Furthermore, the results show a non-significance indirect effect between institutional pillars, drivers/barriers, and innovation selection. This means that the data provide little or no evidence that the drivers and barriers have any effect on innovation selection. This is due to the number of responses included in the study. Thus, increasing the number of responses might solve this challenge and support previous research suggesting that there are some factors that would enhance or block the sustainable shift in companies ([Orji, 2019](#)). According to this study, this might mean that the company's innovation selection criteria seem to depend on the company's management team and its employees who have initiatives to adopt new sustainable activities in the company.

Finally, the results show that management experience dampens the effect of the regulative pillar on sustainable transition (H4a) but strengthens the effect of the regulative pillar on innovation selection (H4d). Thus, the results show that managers with long management experience might find it difficult to adopt sustainable shifts in their companies, but they are willing to select suitable innovative projects. The reason might be that it is difficult for them to adapt new sustainable changes and facilitate these changes within employees. In addition, introducing new sustainable projects to an established company requires a large investment and, more likely, new partners. Furthermore, managers with long management experience would not prefer to invest in new technologies that are different to what they are used to do.

In addition, management experience strengthens the positive effect of the normative pillar on sustainable transition (H4b) and innovation selection (H4e). This means that employees with longstanding management

experience have a self-interest to shift the company toward sustainability, and they are willing to introduce new sustainable activities to the top management team. Furthermore, the results show that management experience strengthens the effect of the cognitive pillar on sustainable transition (H4c); however, it dampens the effect of the cognitive pillar on innovation selection (H4f). This indicates that employees with longstanding management experience understand the importance of engaging the company in new sustainable practices. However, the new sustainable shift taking place in the company still needs time to be accepted and understood by everyone.

Consequently, the contribution of this study is that the survey and model developed help to understand how an established company under a sustainable transition selects its sustainable projects and the kind of drivers/barriers that would enhance or hinder such a selection process. Thus, the results show that the regulative and normative are the potential carriers of the sustainable selection criteria.

## CONCLUSION, LIMITATIONS, AND FUTURE STUDIES

This study aimed to make a methodological contribution to the research of sustainability transitions and organizational culture by developing a valid measure of regulative, normative, and cognitive legitimacy. This study has developed and empirically validated a survey instrument for studying innovation selection toward sustainability in an established OG company. The results showed us that regulative and normative pillars play an essential role in selecting a sustainable strategy in the company. The results also show that sustainability has been embedded in the company and that drivers/barriers have no effect in enhancing or hindering the company's investment in new sustainable activities. In addition, generally, longstanding management experience increases the sustainability awareness in companies.

This study contributes to the broader literature on sustainability transition by developing a measure from institutional theory. Thus, this study makes three contributions. First, the main contribution of this paper is the developed framework that presents a tool to understand a company's innovation selection approach. Second, the study helps researchers understand how sustainability is developed and embedded in the company. Third, the study helps researchers understand how sustainability would be perceived in the company.

In addition, the study improved both the empirical and theoretical rigor of sustainability transition theory and institutional theory. Thus, the author believes that the developed model was conceived as an initial measure of an innovation selection approach in a company under a sustainable change. This study applied the latent common methods variance factor in order to handle the problem of the CMB. Podsakoff, Mackenzie, Lee, and Podsakoff (2003) evaluated various statistical techniques that can be used to control CMB and they mentioned that there is no single best method for handling the problem. This means that the applied technique in this study still exists.

However, the study represents a specific example of a single European OG company, which makes it difficult to generalize. In addition, the number of responses was not high, which affected the result achieved. Thus, additional studies in other cultures, industries, and research contexts are required in order to generalize this framework and survey in the future. This would require studying the strategy-making process in companies in order to understand how companies in different industries respond to sustainable challenges. In sum, this developed model should provide a useful tool with which researchers can explore a variety of issues regarding selecting new sustainable projects in established companies.



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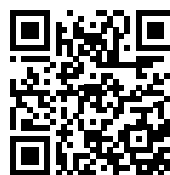
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## APPENDIX A

**Table A1.** Items used in the survey.

Variables	Items
Regulative pillar	<p>Your management team supports renewable energy activities</p> <p><b>There are incentives for sustainable activities at X Company***</b></p> <p><b>X Company has policies to enhance its sustainable development practices***</b></p> <p>Your management team has clear goals to make X a sustainable company</p> <p>Top management plays an important role in making X a sustainable company</p>
Normative pillar	<p>Employees want to contribute to a variety of sustainable projects in my unit</p> <p><b>Individual initiatives toward sustainability are respected in my unit***</b></p> <p><b>Sustainable activities are seen as the way toward future opportunities in my unit***</b></p> <p><b>Operating sustainability is a goal in my unit***</b></p> <p>In my unit, we believe that we have a personal responsibility/commitment toward society/the environment</p>
Cognitive pillar	<p><b>My unit has a good understanding of sustainability***</b></p> <p>My unit has a good understanding of sustainable technology</p> <p><b>My unit builds knowledge on becoming more sustainable***</b></p> <p><b>My unit is always looking for additional ways to improve sustainability***</b></p>
Sustainable transition	<p><b>X Company has established environmental targets to introduce a shift toward sustainability***</b></p> <p><b>Sustainability will become considerably more important to X Company in the future***</b></p> <p>X Company has implemented sustainability goals into its overall strategy</p> <p>This is the right time for X Company to introduce clean activities into its business practices</p>
Innovation selection	<p><b>The project should be within our core strategy***</b></p> <p><b>It should be covered by our competence***</b></p> <p><b>It should represent an interesting market***</b></p> <p><b>It should serve the interest of our top manager***</b></p> <p>It should achieve high return on investment (ROI)</p> <p>It should achieve a positive environmental profile</p> <p>It should achieve a positive social profile</p>
Drivers	<p>Customer expectations</p> <p>'Green' strategy</p> <p>Internal requirements</p> <p>Corporate culture</p> <p>Knowledge of sustainability</p> <p><b>Use of new technology***</b></p> <p><b>Development of new technology***</b></p> <p>Return on investment of 'green' technology</p> <p>Demand from investors</p> <p>Reputation of the firm</p>
Barriers	<p>Lack of financial funds</p> <p><b>Lack of competence and capabilities***</b></p> <p><b>Lack of employee motivation***</b></p> <p><b>Lack of technology***</b></p> <p>Lack of support from top management</p> <p>Lack of return on investment (ROI)</p> <p>Lack of perceived importance (ex.: Giving priority to other activities)</p>

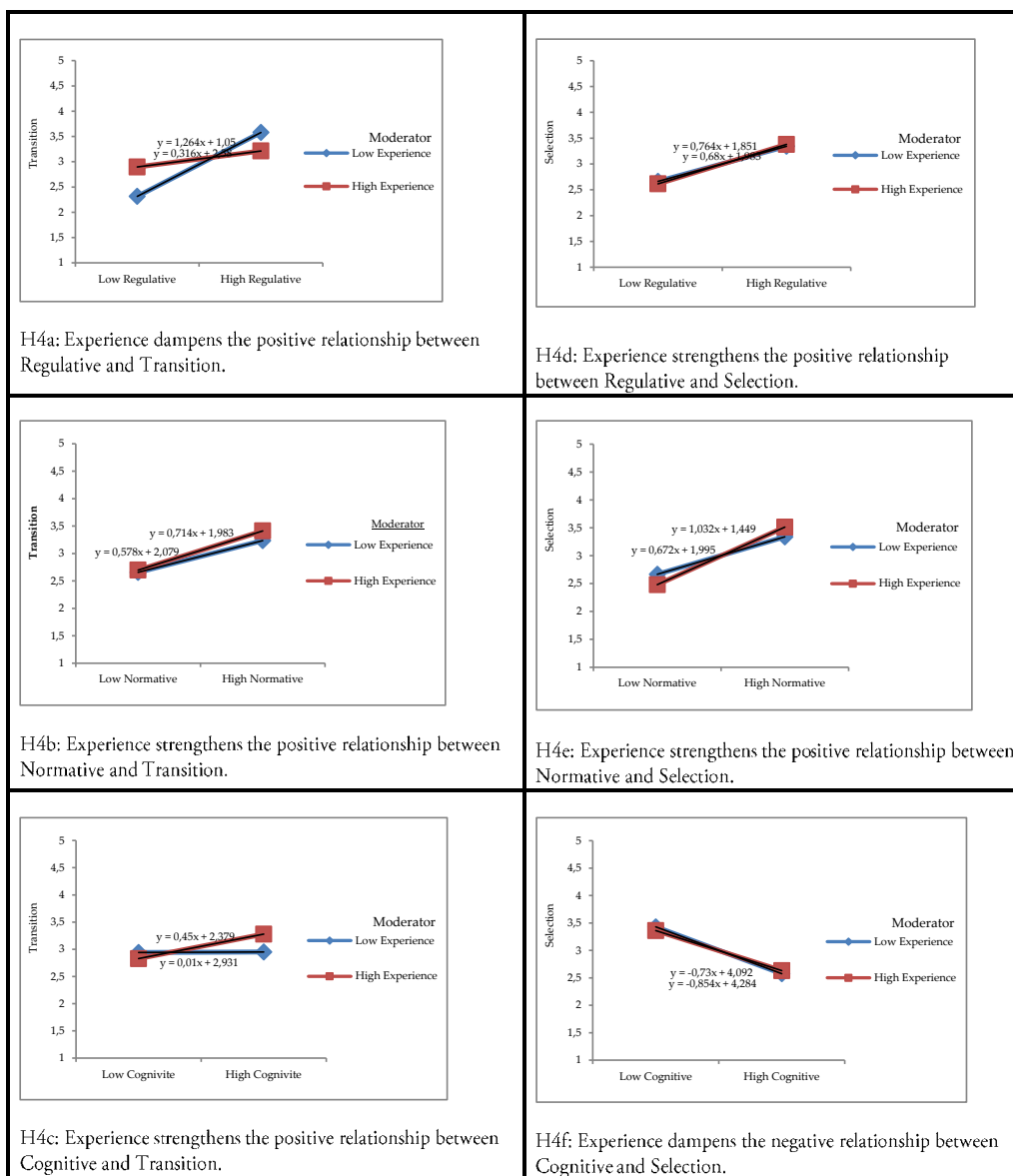


Figure A1. Figures derived from the moderator effect test.

**Table A2.** Summary of the analysis of hypotheses.

Hypothesis	Quantitative analysis	Comment
Hypothesis 1a	Supported	The regulative pillar increases the effect of innovation selection on sustainable transition. This confirms that the case company has new policies and laws to invest in new sustainable activities.
Hypothesis 1b	Supported	The normative pillar increases the effect of innovation selection on sustainable transition. This confirms that the employees are engaged in the sustainable shift that is happening in the company and they are willing to introduce new sustainable projects to the top management team.
Hypothesis 1c	Not supported	The cognitive pillar dampens the effect of innovation selection on sustainable transition. This is due to the negative effect on this factor. This means that lack of sustainability knowledge increases the intention to select more RE activities. This shows that employees might need to find new knowledge to shift the company toward sustainability.
Hypothesis 2	Not supported	The sustainable drivers have no effect on the company's innovation selection. This confirms that the company itself was interested in adopting new sustainable practices into its business.
Hypothesis 3	Not supported	The sustainable barriers have no effect on the company's innovation selection. This confirms that the barriers could not prevent the company from adopting new sustainable activities.
Hypothesis 4a	Not supported	Experienced managers weaken the relationship between the regulative pillar and sustainable transition. This shows that experienced managers have some difficulties in shifting the company toward sustainability.
Hypothesis 4b	Supported	Experienced managers strengthen the relationships between the normative pillar and sustainable transition. This shows that the employees have a self-interest to shift the company toward sustainability.
Hypothesis 4c	Supported	Experienced managers strengthen the relationship between the cognitive pillar and sustainable transition. This shows that the employees understand what would satisfy external audiences and understand the importance of the sustainable change.
Hypothesis 4d	Supported	Experienced managers strengthen the relationship between the regulative pillar and innovation selection. This shows that experienced managers are willing to select appropriate sustainable projects into their companies.
Hypothesis 4e	Supported	Experienced managers strengthen the relationships between the normative pillar and innovation selection. This shows that the employees have a self-interest to introduce new sustainable projects to their top management teams.
Hypothesis 4f	Not supported	Experienced managers weaken the relationship between the cognitive pillar and innovation selection. This shows that the sustainable shift still needs time to be accepted and understood by everyone.