




# “Business model for integrated sustainable value creation: A supply chain perspective”

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# BUSINESS MODEL FOR INTEGRATED SUSTAINABLE VALUE CREATION: A SUPPLY CHAIN PERSPECTIVE

## Abstract

In the context of globalization, the process of value creation is becoming more complex, exposed to greater risks for companies, partners, and customers. Moreover, modern digital technologies, such as the use of digital twin technology, can increase the use of geographically dispersed work teams and contribute to sustainable value creation in the future. However, the digital transition creates new organizational models and influences relationships in supply chains, thus affecting structural changes in business models.

Hence, the study aims to investigate, from the whole value chain perspective, how the next generation of digital services is affecting business value and changing the business model concept. In addition, this paper discusses the stakeholder and social responsibility value creation perspective on business model for integrated sustainable value creation.

To investigate this, it was decided to use a quantitative methodology in the form of questionnaires, which were distributed among different interested parties: two contractors, three suppliers, and an operator.

The results indicated that all respondents, such as an operator, shipping companies, and subsea service providers, are positive about future digital technologies, which should ensure environmental sustainability, improve human interaction and communication. At the same time, they emphasize the importance of integrated joint work within the value creation element. Overall, all participants are interested in reducing costs, they expect initiatives from each other in offering sustainable and innovative solutions, and to achieve these, innovative cooperation is needed.

## Keywords

value creation, business models for sustainability, stakeholder and social responsibility frameworks

## JEL Classification

M10, O14, Q55

## INTRODUCTION

New environmental regulations are increasingly driving innovation and thus opening up new opportunities and creating tighter relationships between the oil and gas, maritime and subsea sectors. It is believed that innovation and new technology will help adapt to a green future because the goal is to cut emissions while facilitating sustainable green growth.

Digital transition (technological development) contributes to sustainable value creation. Nevertheless, is it possible to achieve that using the same business models and the same relationship types? This currently relevant question has not been widely discussed in the economic literature.

In addition, how this can contribute to industrial value creation and economic growth of a country? Many findings show that without appropriate governmental assistance it is almost impossible at the initial stage of introducing new technologies.



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### Conflict of interest statement:

Author(s) reported no conflict of interest

In this regard, academia, industry, and other key actors work together to reveal the opportunities of digital transformation for growth, which is beneficial for companies and institutions.

For example, NTNU in Ålesund works together with industrial partners towards revealing the potential benefits of using new digital solutions in marine operations. As part of the remote technologies and digitalization, a revolution in the subsea industry is currently taking place.

The vaunted Industry 4.0 and the emergence of sophisticated autonomous vehicle (AV) technologies are opening up new avenues for value creation, giving the opportunity to enter new markets and identifying a country's potential competitive advantage. This happens when companies view their business through a new lens, so emerging digital solutions are forcing companies to change their business models.

To explore this idea, it was decided to take a case on the use of new Remotely Operated Vehicle (ROV) systems. The topic of this area is closely related to sustainability, i.e., sustainable ROV inspections and digitalizing ROV operations are very important as for maritime, oil and gas and for other industries.

On this base, the offshore oil and gas industry (O&G) is investing funds to develop the work-class ROVs, such as Resident ROV (RROV) and Empowered ROV (eROV), to assist in developing offshore oil fields. The main feature of this technology is that it allows utilizing the onshore control center (OCC). In 2019, NTNU in Ålesund set up a remote operation center, the main idea of which is "to run experiments, design new solutions, implement, test and observe the effect of new solutions" (SFI MOVE, 2018).

It is believed that new ROV systems, together with the onshore control center solution, are the step change towards an unlimited potential in ROV and subsea operations for the future. ROV together with the onshore control center can assure improved ROV operations. The main motivation of this new digital solution is three-fold:

- Increased quality by: access to a broader variety of competence; access to specialized competence, in particular for challenging tasks that are executed infrequently; access to competence from suppliers.
- Increased performance and optimization: by better decisions using advanced analytics as part of digital twins; to set up an organization to handle an unpredictable situation; increased awareness concerning dispersed team collaborations.
- Reduced costs by: having part of the crew onshore; better prediction of service need.

One of the current challenges of this new paradigm is to demonstrate the possible economic and other non-monetary benefits by adapting to new concepts and new technologies (business-oriented innovation). Hence, new technologies require new solutions, organizational changes, and collaboration ties.

This paper begins by examining the existing business model literature and related corporate social responsibility and stakeholder theories regarding integrated sustainable value creation.

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## 1. LITERATURE REVIEW

### 1.1. Sustainable value creation

Lots of different findings show that "digital technologies support the development of value propo-

sitions that blend environmental, social, and economic value" (Gregori & Holzmann, 2020). Yang et al. (2017) consider value from a sustainable context, they argue that the term "sustainable value" covers not only monetary aspects, but also a wider range of value for society and environment.

Typical definition of the idea of “sustainable value creation” refers to “a promise on the economic, environmental and social benefits that a firm’s offering delivers” (Patala, et al., 2016). Stubbs and Cocklin (2008) developed their own concept of a triple bottom line that can help give current definitions of “sustainable value creation” in the field of the sustainable business model. This concept considers the planet, people, and profit.

According to Freeman and Gilbert Jr. (1992), usually social and environmental goals are subordinated to the main goal of creating economic value. This paradigm is inherently limited in its ability to effectively combat social and environmental degradation. One view is that for firms to be sustainable, the business model must be transformed rather than complemented by social and environmental priorities (such as environmental protection, respect for people and nature, and social justice).

Recent research has adopted the notion of sustainable value creation “coined by the integration of technological and management methodologies” (Bilge, 2017). Hence, the last aspect reveals an important and huge role of a business model in capturing value from innovation. In general, a business model logically describes how a firm creates, captures, and delivers value to customers – economic, social, and other its forms.

Thus, since the 90s of the last century, economic theory has begun to develop issues of forming business models of companies, a useful tool the use of which allows transferring the problem of intellectual capital from the theoretical sphere to practical application for the purpose of increasing companies’ competitiveness and sustainability.

In recent studies, the research from Harvard Business School documented that “leading companies that have adopted a digital-first business growth strategy generate better gross margins, better earnings and better net income than organizations that haven’t done it”. Moore (2019) concluded that “what is driving this improved value creation performance is the emergence of new, more profitable business models that deploy new digital technologies like social, mobile, cloud, analytics and IoT”.

## 1.2. Corporate social responsibility for sustainable value creation

Justifying the directions of improving capitalism and the activities of companies, scientists, experts, and politicians most often argue technological (introduction of new equipment, technologies) and managerial (introduction of new business processes) innovations, i.e., the areas that can significantly increase labor productivity, and as a result, the efficiency of the economy as a whole, strengthen the competitive position of business. The problem with this approach is that it does not imply fundamental changes in the socio-economic structure of society, the measurement of social progress, as well as a paradigm shift in creating value chains (Porter & Kramer, 2011).

When building a value chain, any company today inevitably comes into contact with the most important problems for society (and experiences them on itself), such as the use of natural resources, human health, working conditions, and safety. It becomes clear that the value chain itself requires rethinking (Porter & Kramer, 2011; Krugman, 2009; Stiglitz, et al., 2009).

The first attempts to change the vision in the value chain are associated with the development of the concept of business social responsibility or corporate social responsibility (CSR). Recently, this is one of the most developed concepts in economics and management; more than 50 years have passed since the first publication on the problems of a businessman’s social responsibility appeared (Bowen, 1953). Most researchers interpret social responsibility as voluntary business assistance to society through the implementation of socially significant projects and programs, participation in solving vital issues in the field of ecology and environmental protection, health protection, education, development of the territories where companies are present (Nehohod, 2015).

Thus, the sustainable development of companies (corporate sustainability) presupposes an orientation towards the main interests and needs of key stakeholders (consumers, business partners, representatives of the local community, government agencies, society). They influence a company by determining its access to resources. Therefore, the

company must function in such a way as not to worsen, but, if possible, to improve their well-being.

For instance, when it comes to the Norwegian business tradition, it emphasizes the role of social responsibility of companies, especially as it relates to their role as “corporate citizens” of local communities (Liland, 2021), and such responsibility includes concern for oneself and one’s surroundings (Grytten, 2021).

In 2006, M. Porter and M. Kramer in the article “Strategy and Society: The Relationship Between Competitive Advantage and Corporate Social Responsibility” proposed the concept of creating Shared Value (CSV). Later, this concept was developed in the article by the same authors “Creating common values” (Porter & Kramer, 2011). The concept is based on the assertion that social behavior and the commercial success of companies are interdependent; achieving both social and economic progress must take into account the principles of value creation. Just as society is interested in efficient, profitable enterprises to increase the wealth of owners and employees, who will subsequently make large tax payments and have the opportunity for charity, so business needs a quality workforce and sustainable provision of resources in order to be competitive in the modern world, especially in the long run. The authors of the concept identified three ways to create and increase shared value:

1. First, changes in the structure of products and markets to better meet social needs.
2. Second, the reconfiguration of the value chain by reducing costs, increasing the reliability of supply, and using new technologies.
3. Third, the localization of the cluster approach in development by creating a company ecosystem, since companies need to have strong ties with local partners and local communities in order to function successfully.

As for the relationship with the outside world, the essence of the approach lies in the fact that the earlier corporate strategy is based on a close relationship between sustainable value creation and R&D cost (Koilo, 2021b). It was revealed that the impact

of R&D investment on the economic growth of a country, companies’ performance is significant. Nevertheless, only together with efficient public support and interorganizational collaboration it can contribute to creating new business value, also, it can strengthen an existing product or service with additional features.

Accordingly, open business models can be used to create and maintain value through the interaction with external partners. This can be done “from the outside” - through the use of external ideas, or “from the inside” - by providing third-party partners with ideas or assets not required by the firm. Open innovation and open business models are terms coined by Chesbrough (2003). He suggests that research processes are open to third-party companies. Chesbrough (2003) argues that in a world characterized by dispersed knowledge, organizations can create more value and better utilize R&D outputs by leveraging outsourced knowledge, intellectual property, and products in their innovation process. Chesbrough divides innovation into “outside” and “inside”. Innovation comes “from the outside” if a company does not use its own ideas, technologies, or intellectual property in the process of development and commercialization.

### 1.3. Stakeholders’ value creation framework

Thus, based on the chosen business model, it is possible to develop a unique business model that allows achieving competitive advantages and providing effective implementation of the scientific and technical potential of an enterprise personnel for each specific enterprise.

Norris et al. (2021) integrate a relational view of sustainable supply chain management into the management of sustainable business models.

According to Sadovska et al. (2020), innovativeness, knowledge acquisition, and collaboration with external stakeholders play a key role for sustainable value creation.

Freudenreich et al. (2020) see business models in line with “corporate sustainability ambitions and stakeholder expectations”. The authors ar-

gue that to solve sustainability-related issues, a new relationship perspective on business models is needed.

The same view on a business model leads Freeman (2010) to conclude: “Stakeholder theory proposes that value creation is a collaborative effort in relationships, ideally benefitting the focal business and all its stakeholders”.

Hence, this stakeholder value creation framework is inevitably important for the current orientation of sustainable business models (Sommer, 2012).

The importance of partnership in the value chain is highlighted in the study of McKinsey & Company employees. They developed three approaches, the main idea of which is to improve the sustainability of companies’ business models (Bove & Swartz, 2016).

Based on this, it was decided to summarize theoretical findings (Figure 1) and build the framework of integrated sustainable value creation from corporate social responsibility and stakeholder perspectives, considering linkage between the concepts of business models (managerial aspect) and emerging technologies (technological aspect).

All of the above proves that “sustainable value creation” and the use of an appropriate business model should be seen from the entire value chain rather from separate focal firm, since the business model considers customers, suppliers, and investors as units of analysis for value creation.

The theoretical findings mentioned above highlight the need to examine this linkage and practical implication of the proposed framework.

Hence, this paper aims to investigate, from the whole value chain perspective, how the next generation of digital services is affecting the business value and business models’ structural changes. For the study, it was decided to take a case on the use of new Remotely Operated Vehicle (ROV) systems.

## 2. METHODOLOGY

There are several forms of method collection that could be used for qualitative data sampling such as observation, focus groups or interviews. It should be noticed that here, in this study, there are a few numbers of participants that could be examined, hence it has been possible to use a quantitative survey in the form of questionnaires.

Source: Author’s elaboration.

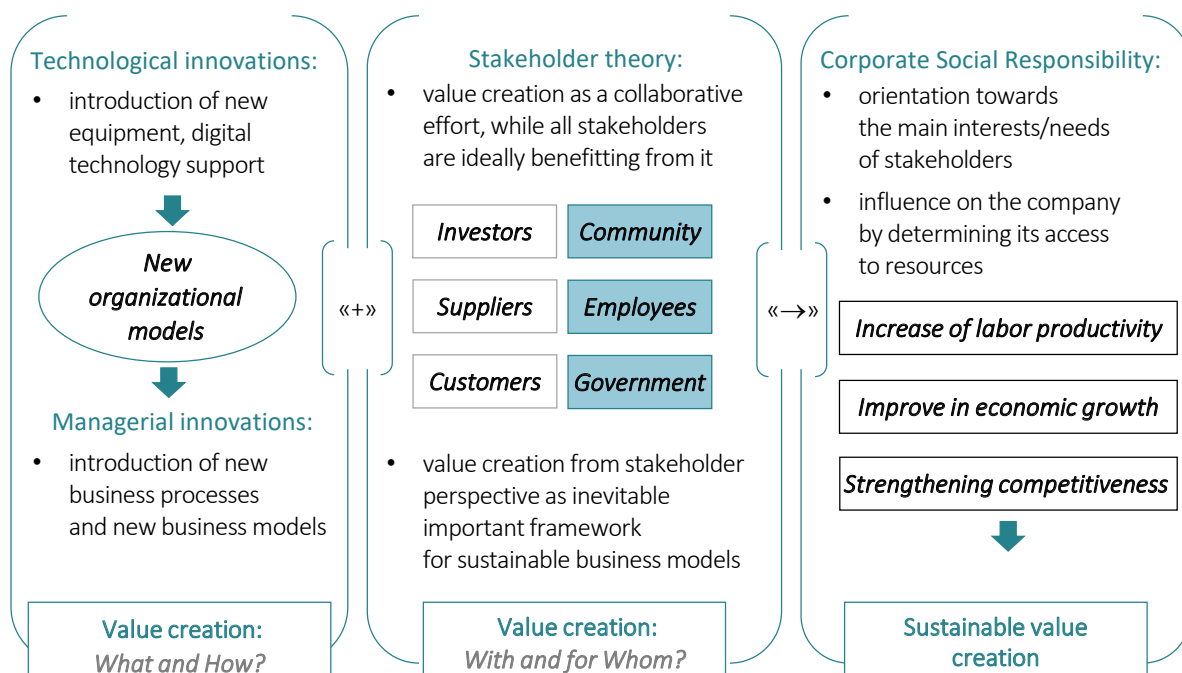


Figure 1. Linking integrated sustainable value creation, CSR, and stakeholder perspectives



Applying a qualitative research design enables adequate study and description of business model's structural changes and benefits of implementing digital practices. Furthermore, the proposed methodology helps to examine complex relations between the interested parties.

### 2.1. Data collection

Six different companies were identified that are actively involved in remote operation activities and expressed their willingness to participate in the study (Table 1).

Hence, two contractors were involved (shipping companies which operate within the subsea segment), three suppliers of ROV systems (subsea companies), and one operator (oil company that explores, develops fields, and produces oil and gas).

It should be noted that some participants in this survey are partners of the SFI MOVE project (two of six). In addition, other four respondents (external interested parties) also showed their willingness to contribute to this investigation. The choice of external companies was based on the previous investigation of various sources such as homepages, blog posts, social media information, newspaper articles, as well as recommendations from colleagues at NTNU.

The answers were anonymized, thus, instead of using the real names, the following codes were proposed: "Operator", "Contractor #1", "Contractor #2", "Supplier #1", "Supplier #2", and "Supplier #3".

To get an insight on how digital services affect the business value and change the business model concept, the questionnaire consisted of several blocks. The participants were asked about:

- 1) Remote operation activities status.
- 2) Business model structural changes:
  - Business model shifts during the last year in general.
  - Business model changes through the introduction of new ROV.
- 3) Required future competence and public support.
- 4) SWOT of the introduction of new business models.

Building on the notion that sustainable value creation is coined by the integration of technological and management methodologies, and new business models should be considered from corporate social responsibility and stakeholder perspectives, comprehensive primary data was collected.

### 2.2. Data analysis

As stated earlier, SFI MOVE aims to enhance the collaboration between the university and industry, so it was important to make research results useable for industrial partners. Thus, the interpretation of the data was optimized for data analysis by

**Table 1.** Case description and collected data

Segment	Coded name	Position
Oil and gas	Operator	Subsea Execution Manager – inspection and repair of subsea production systems equipment – subsea engineer, technical authority and now department manager. 15 years experience in oil & gas.
Shipping	Contractor #1	Ship Manager with 14 years experience as this position.
	Contractor #2	Vessel Manager, in charge of 4 CSV vessel operating WW. Previously been deck officer and Captain in similar fleet in same company.
Subsea	Supplier #1	Responsible for pioneering Remote Operations Center.
	Supplier #2	Worked in the company for more than 20 years within engineering functions and project management. Currently responsible for operations and projects in the company (Norway).
	Supplier #3	Offshore operations manager for Norway operations since 2017. In the company since 1998. Was previously installation engineering manager in Norway from 2006 to 2017.

involving some facilities, such as Microsoft Excel. Also, web-based SWOT Analysis software and a Business Model Canvas Tool were used. The final results were presented according to the coding procedure in the data structure.

### 3. RESULTS

#### 3.1. Remote operation activities status

To map the status of remote operation activities (controlled from onshore), the group of participants involved in this study were asked several introduction questions, such as “*What is your position at the company?*”, “*How do you position your company in the remote operations segment?*” “*What types of products and services do your company provide in this regard?*” The results were the following:

1. Operator: widely uses remote operations, both control room and ROVs.
2. Contractors (2): #1 provider of vessels, sub-contractors supplying ROV; #2 provider of offshore cranes and survey duties, the vessels with WROV (Subsea vessels), along with Anchor Handling Tug Supply vessels (AHTS) and Platform Supply Vessels (PSV).
3. Suppliers (3): #1 company operates the world’s premier fleet of ROVs and is the leading provider of ROVs to the oil and gas industry, as well as a provider of engineering and solution services to other industries; #2 provider of remote operations by ROV and tooling as part of subsea operations while building, installing and pre-commissioning subsea umbilicals, risers and flowlines and subsea structures, protection systems associated with these, also, the inspection, maintenance and repair of subsea systems; #3 provider – beginner, however, involved in remote life of field data acquisition on behalf of operators for some time now.

#### 3.2. Business model changes in a company

This block of questions was divided into two sub-categories: 1) Business model shifts during the last

years and 2) Business model changes through the introduction of new ROV.

##### 3.2.1. Business model shifts during the last years

First, it was important to determine what business model shifts the investigated companies experienced during the last years due to the 2014 oil price collapse and due to the coronavirus pandemic.

Many participants agreed on cost base reduction in all respects: strict cost management, structural model adjusted in regions and on the corporate level. In addition, a positive aspect was identified among all actors – strengthened collaboration with suppliers (frame agreements, alliances), acquisitions and technology collaboration were a key thing of the challenging period. Moreover, “introduction of remote operation technology has been one of our most important measures to cope with the challenging market”, responded one of the suppliers of ROV systems.

Concerning the COVID-19 pandemic, in many cases, it has forced companies to implement more remote operations; the maturing of digital solutions related to remote operations (extended reality/OR/VR) where travel was not possible; in addition, less travel has also become a new standard, but is primarily related to onshore activity.

When it comes to internal/external factors that have contributed to innovations in business models during the last 10-15 years, the respondents could choose among proposed variants what is relevant for their companies. The results are depicted in Table 2.

To sum up, among the responses, the most popular internal factors for companies were new products or services, organizational changes. In addition, technological change, environmental regulations, and customer preferences were identified as major external factors that contributed to innovations in business models during the last 10-15 years.

Furthermore, the participants were asked about their willingness to collaborate with other actors in building innovation business model (BM). Here everyone was positive to collaboration in this regard.



**Table 2.** Factors that have contributed to innovations in business models during the last years

Factors	Operator	Contractor 1	Contractor 2	Supplier 1	Supplier 2	Supplier 3
<b>INTERNAL FACTORS</b>						
New products or services	✓	✓	✓	✓	✓	✓
Organizational changes	✓	✓	✓	✓	✓	
Access to resources		✓			✓	
<b>EXTERNAL FACTORS</b>						
Technological change	✓	✓	✓	✓	✓	✓
Environmental regulations	✓	✓		✓	✓	
Public policy	✓		✓	✓	✓	
Competition	✓	✓			✓	✓
Customer preferences		✓	✓	✓	✓	
Value chain changes	✓			✓	✓	
Customer segments		✓			✓	
Global international changes				✓	✓	

Concerning the changes in the companies’ relationship with competitors and other players in the industry as a result of today’s demanding restructuring period (due to new ROV systems), the results of the responses turned out to be quite different: they changed for the operator and one of the suppliers, but remained the same for two shipping companies and other two suppliers.

**3.2.2. Business model changes through the introduction of new ROV systems**

In another block of questions, participants had to scale from 0 to 5 replying on “To what extent the following structural elements of the business model can be changed as a result of the introduction of new remote operations (controlled from onshore)?” Where: 0 = Didn’t change to 5 = Changed a lot.

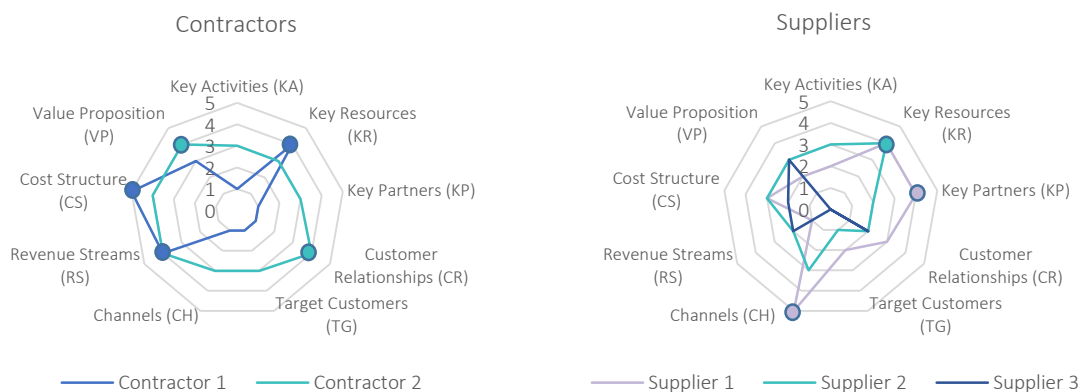
It should be noted that key structural elements of BM were divided into the following nine categories (Koilo, 2021a): Key Activities (KA), Key Resources

(KR), Key Partners (KP), Customer Relationships (CR), Target Customers (TG), Channels (CH), Revenue Streams (RS), Cost Structure (CS), Value Proposition (VP).

The results of the investigation are presented in Figure 2.

The analysis showed that for contractors, key resources, customer relationships, revenue streams, cost structure, and value proposition could be considered like the most highly impacted elements of their business model due to introduction of new ROV systems.

It is important to note that for ROV system suppliers, changes in BM’s structure are different. In fact, everyone described that although there are some similarities with contractors in elements changes, like key resources, nevertheless, key partners, channels are considered as the most imposed due to the introduction of remote operation activities (controlled from onshore).



**Figure 2.** Business model structural changes through the introduction of new ROV systems

### 3.3. Required future competence and public support

Autonomous technology is reshaping the world of work. Hence, it is important to investigate which competencies will the labor market need in the future. In addition, although public support for innovation, which comes in many forms, is not always easy to measure, it plays a significant role for many firms, so it was decided to analyze this aspect as well.

Thus, the questions in this section were devoted to required future competence requirements and public support that will be needed in the future.

The respondents were asked to rank the five most important policy instruments required to perform new remote operation activities, where the scale was from 1 = Least important to 5 = Most important.

The results of the survey showed that for a operator, R&D funding, business development funding, support for testing and demonstration are among the most important tools to support the implementation of new ROV systems. These tools are also relevant for suppliers and they also considered environmental/carbon tax and provision of enabling infrastructure as more important policy instruments for support (Figure 3). When it comes to contractors, the results were quite different. For example, information brokering, support for net-

work, partnership and consumer subsidies and pricing, along with education and training, performance standards, labelling and certification, are scrutinized as crucial for support.

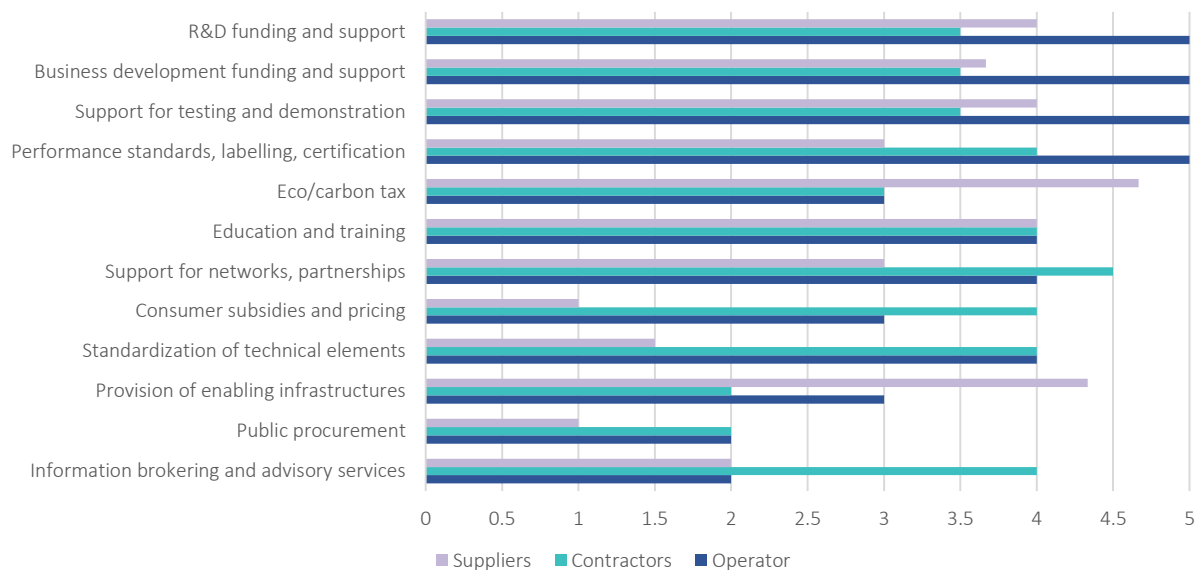
The same task was related to future competence: participants had to rank the five most important sources of skills required to perform new remote operation activities. The scale was the same (Figure 4).

It should be stated that in-house resources and training, company partnerships, recruiting experts, and international partnerships are considered mostly by all respondents as the most relevant and needed future competence/skills to work with new remote operation activities.

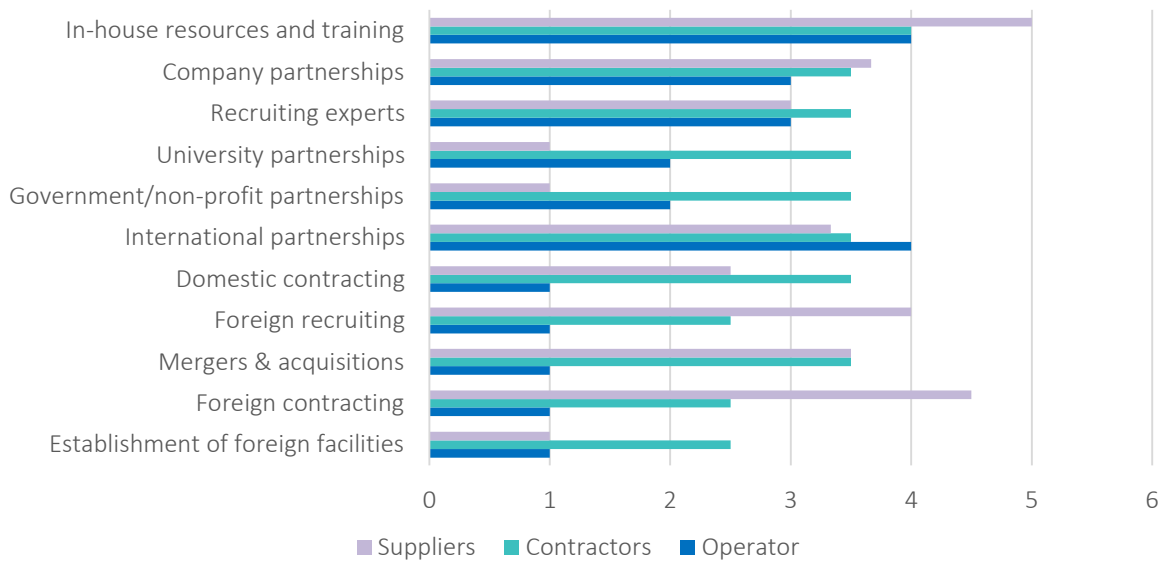
### 3.4. SWOT of the introduction of new business models

SWOT analysis is an important strategic planning tool, it helps effectively evaluate the position of a company before moving forward to implement important decisions. Hence, it is important to understand the business better and be aware of opportunities, benefits, along with limitations and issues at the company.

For this reason, in this study, the participants were asked to point out key potential Strengths, Weaknesses, Opportunities, and Threats that can be identified by the introduction of new ROVs systems.



**Figure 3.** Policy instruments required to support the implementation of new ROV systems



**Figure 4.** Future competence and skills needed to perform new remote operation activities

The results of the SWOT analysis were divided separately, and each Table 3-5 contains the information from Suppliers', Contractors', and an Operator's view.

Table 3 shows that improved safety for personnel, operational stability and flexibility, improved carbon footprint, and reduced operational cost are considered as important current and potential advantages of using ROVs controlled from onshore.

Despite many positive aspects, suppliers identified robustness of datalink, cybersecurity, potential loss of interaction, governmental/political policy change, and risks associated with interference and

downtime related to the communication technology as the most important challenges in the introduction of new remote technologies.

When it comes to Contractors, reduced operational cost, flexibility and availability are identified as the main positive aspects of new ROVs (Table 4). In addition, loss of connection between vessel and operation station, loss of experience and human contact/unformal communication, and maintenance resources are considered as main weaknesses and threats on the way of the implementation of new ROV systems.

The results from Table 5 (Operator's side) show that installing electric thrusters would reduce the con-

**Table 3.** SWOT analysis of the introduction of new ROVs systems (Suppliers' view)

Strengths	Weaknesses
Operational stability and flexibility	Restricted physical access to assets
Lower maintenance cost and improved effect of remote control	By reducing direct capacity to intervene offshore, the operational efficiency can be temporarily impacted
Improved safety for personnel, improved carbon footprint	Robustness of datalink, cybersecurity, new operational communication (potential loss of interaction)
	If one team shares several assets, planning and priority may become an issue
Opportunities	Threats
Shorter lead time for operation start-up, greater flexibility in shorter maritime campaigns	Governmental/Political policy change for "over-horizon" asset operation, i.e., Aerial Drone Industry
Can significantly reduce operational costs during the field life and to some extent during the build phase	More reliant on 4G, 5G, satellite communication can introduce risks associated with interference and downtime related to the communication technology
The use of subsea resident remote systems, drones and live sensors has a large potential	In the beginning, the acceptance by competent personnel to have a reduced pay working onshore
One team capable of sharing several assets, resulting in scale savings	

**Table 4.** SWOT analysis of the introduction of new ROVs systems (Contractors' view)

Strengths	Weaknesses
Easier to mobilize, lower cost, concentrated competence	Communication between an operator and vessel, bad teambuilding between ROV operators and vessel Maintenance resources Team toolbox talks, human contact and caring of each system related to maintenance
Opportunities	Threats
Shore concentration can give more availability, lower price Less crew on board Correct resources and more flex in new operators	Loss of connection between the vessel and operation station Loss of experience from real life operation and relations between operation and vessel The informal communication can get lost

**Table 5.** SWOT analysis of the introduction of new ROVs systems (Operator's view)

Strengths	Weaknesses
Installing electric thrusters and environmentally friendly fluids would reduce the consequence of a spill to sea	Electric ROVs are still less powerful than hydraulic powered Less people offshore mean fewer hands to fix problems as they occur (the ROV itself or any part of LARS)
Opportunities	Threats
Additional ROVs can be made available without having to go to shore to man up	Remote ROVs and resident ROVs in particular may get lost in sea Investment cost may outweigh the benefit, especially for brown field (mature installations)

sequence for the environment, but still they have less power compared to hydraulic powered ROVs. In addition, capital costs are high, so investment costs can outweigh benefits, so it is considered as the main threat for this group of respondents.

### 3.5. Value chain relationship in remote operations

The last block of questions was devoted to the value chain relationship in remote operations. Participants were asked several questions regarding their future vision of relationships with other parties regarding the remote operations in the future. For example, one of them was: "What do you expect for the future regarding the cooperation with your suppliers (regarding the remote operation activities)?"

The respondents were quite similar in their answers, which are positive and indicate their willingness to collaborate: Operator: "We hope to continue the work enabling more remote operations to take place. Business cases are not always as good as one could hope". Contractor #1: "Give the company cost reducing solutions that can be trusted and approved by our end clients". Contractor #2: "They need to be updated and at the same level as the competitors". Supplier #1: "Proactivity in proposing solutions which as a whole will provide cost savings while maintaining robustness of ex-

ecution". Supplier #2: "We expect our suppliers to continue to be keen on participating in bringing the remote technology forwards". Supplier #3: "Good and innovative collaboration is the expectation."

Another important question was related to competition in this segment. Participants were asked the following: "Has companies' relationship with competitors and other players in the industry changed as a result of demanding remote operations activities?"

The results show that most companies are quite positive about cooperation with competitors, which together guarantees lower operating costs, provides technological improvements, and helps to work towards environmental sustainability.

## 4. DISCUSSION

This section presents the links between the results of this study and the existing literature, providing suggestions for researchers and companies for putting these results into practice and providing ideas for future research.

The results presented in the previous section show that all participants have a positive attitude towards new emerging technologies and believe that in the

future they are going to be more involved in autonomous operations, controlled from the onshore. They put an emphasis on the importance of the future digital solutions, which should ensure environmental sustainability, improve human interaction and communication, and at the same time, give new opportunities within the value creation element.

This relationship is most evident in research on novel insights how digital practices bring value for entrepreneurs. For example, Parida et al. (2019) investigated the connection between broad complementarity, social logic values, digital opportunities within economic growth aspect.

Indeed, lots of findings in economic literature advocate that by combining digital technologies interested parties (stakeholders) can create spaces for community interaction, engage in co-creation activities, and broaden stakeholder integration. Moreover, it enables entrepreneurs to manage the boundaries of their business models and make them more dynamic and open (Caputo et al., 2019). The same ideas can be found in Gregori and Holzmann (2020): “..digital technologies provide unique combinations of value creation components, enabling the practice of community development, co-creation and broader stakeholder integration”.

This study also revealed that the majority of the respondents consider the involvement of participants in various processes in the value chain as a key success factor in increasing the value of marine remote operation activities. Due to transforming period in the industries, all of them are working towards new business models and they are positive to collaborate on this with other actors of the value chain.

In fact, the range of examples in the literature suggests that an important factor in achieving increased profitability is increased communication and interaction throughout the value chain (Evans et al., 2017; Hahn et al., 2018; Stubbs & Cocklin, 2008). This is especially important for sustainable business models, which can be effective when multiple actors come together for dialogue (Hahn et al., 2018).

Moreover, the results derived from the survey highlight those new remote technologies require significant capital costs at the initial stage, hence, the collaboration efforts within the supply chain are a vitally important factor for reducing costs, improving revenue flow, resulting in increased business value and economic growth. Thus, the creation of sustainable business models should include a wide range of diverse stakeholders (Evans et al., 2017; Stubbs & Cocklin, 2008).

In addition, all participants in the interview were clear that they want to acquire more knowledge from the value chain: “when knowledge is shared, we lay the foundation for us to create improvements in the entire value chain”. Thus, communication between operators, shipowners, and equipment providers is a key to success.

The evidence of these arguments can be also found in Sadovska et al. (2020). It was stated that “Collaboration also encompassed topics such as trust and information access. Collaboration occurs at all levels of the value chain, with practical examples being knowledge exchange, common use of processing, testing, and R&D facilities, etc”.

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## CONCLUSION

This paper aimed to contribute to business model research by linking this concept with emerging technologies and considering the integrated sustainable value creation from corporate social responsibility and stakeholder perspectives. For the study, it was decided to take a case on the use of new Remotely Operated Vehicle (ROV) systems.

Hence, the purpose of the study was to examine, from the whole value chain perspective, how the new emerging digital technology affects the business value and business models' structural shifts. To achieve this, it was decided to use a qualitative survey in the form of questionnaires.

Based on this, the current study involved the following interested parties: a company from the offshore oil and gas industry (Operator), two shipping companies that operate within the subsea segment and supply vessels with ROVs on board (Contractors), three companies that provide with ROV systems and other services such as inspection, maintenance and repair of subsea systems (Subsea suppliers).

It was revealed that during the last years, companies experienced changes in business models. In many cases, this has forced companies to implement more remote operations (especially in pandemic period) and work towards cost reduction. Among the most popular internal factors that contributed to innovations in business models over the last 10-15 years for companies were new products or services, organizational changes; among the major external ones are technological changes, environmental regulations, and customer preferences. Furthermore, participants were asked about their willingness to collaborate with other actors in building innovation business models. Here, everyone was positive to collaboration in this regard.

Regarding structural shifts in business models due to the introduction of new ROV systems, the respondents' answers differ. For contractors, the major changes are identified in key resources, customer relationships, revenue streams, cost structure, and value proposition. For ROV system suppliers, the most highly impacted elements of their business model were key partners, key resources and channels. The respondents also admitted that this will require new future competences and more intensive public support will be needed.

The results of SWOT analysis showed that the new developing technology brings operational benefits, improves safety, and provides flexibility and stability in use. Nevertheless, there are threats of using those new digital solutions, such as capital costs, loss of informal communication and salary issues due to the transfer of workers from offshore, etc.

The study revealed the following common expectations: participants are very interested in reducing costs while maintaining the robustness of execution, they expect initiative in offering sustainable and innovative solutions, and to achieve this goal, innovative cooperation is expected. Together, this guarantees lower operating costs, provides technological improvements and helps to work towards environmental sustainability.

## **FUTURE RESEARCH**

To sum up, the results obtained can provide foundations for future research, that is, researchers can give practitioners confidence in business model innovation by conducting further empirical research and suggesting ways in which companies can easily experiment with their business models (Girotra and Netessine, 2013). Therefore, future research could also apply a quantitative study. Cost-NPV analysis, for instance, is beneficial to identify that proposed BMs are properly designed.

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## REFERENCES

1. Bican, P. M., & Brem, A. (2020). Digital Business Model, Digital Transformation, Digital Entrepreneurship: Is There A Sustainable "Digital"? *Sustainability*, 12(13), 5239. <https://doi.org/10.3390/su12135239>
2. Bilge, P. (2017). *Sustainable value creation by applying industrial engineering principles and methodologies*. Retrieved from <https://depositonce.tu-berlin.de/handle/11303/6357>
3. Bove, A., & Swartz, S. (2016). *Starting at the Source: Sustainability in Supply Chains*. Retrieved from <https://www.mckinsey.com/business-functions/sustainability/our-insights/starting-at-the-source-sustainability-in-supply-chains>
4. Bowen, H. R. (1953). *Social Responsibilities of the Businessman*. N.Y.: Harper & Row.
5. Caputo, A., Fiorentino, R., & Garzella, S. (2019). From the boundaries of management to the management of boundaries: Business processes, capabilities and negotiations. *Business Process Management Journal*, 25(3), 391-413. <https://doi.org/10.1108/BPMJ-11-2017-0334>
6. Carlin, W., & Soskice, D. (2015). *Macroeconomics: Institutions, Instability, and the Financial System* (1st ed.). OUP. Macroeconomics. Retrieved from <https://bookdown.org/robohay/economicsnotes/growth-development-and-innovation.html>
7. Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business School Press.
8. Evans, S., Vladimirova, D., Hologado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: towards a unified perspective for creation of sustainable business models. *Business Strategy and the Environment*, 26(5), 597-608. <https://doi.org/10.1002/bse.1939>
9. Freeman, E. (2010). Managing for stakeholders: Trade-offs or value creation. *Journal of Business Ethics*, 96, 7-9.
10. Freeman, R. E., Velamuri, S. R., & Moriarty, B. (2006). *Company Stakeholder Responsibility: a New Approach to CSR*. Business Roundtable Institute for Corporate Ethics. Retrieved from <https://www.yumpu.com/s/qWQm61PJ-4PlmZRqO>
11. Freudenreich, B., Lüdeke-Freund, F., & Schaltegger, S. (2020). A Stakeholder Theory Perspective on Business Models: Value Creation for Sustainability. *Journal of Business Ethics*, 166, 3-18. <https://doi.org/10.1007/s10551-019-04112-z>
12. Girotra, K., & Netessine, S. (2013). *Business Model Innovation for Sustainability* (INSEAD Working Paper No. 2013/77/TOM). Retrieved from <http://dx.doi.org/10.2139/ssrn.2289291>
13. Gregori, P., & Holzmann, P. (2020). Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation. *Journal of Cleaner Production*, 272. <https://doi.org/10.1016/j.jclepro.2020.122817>
14. Grytten, O. H. (2021). Is There Really a Relationship Between Protestantism and Economic Growth? *In the legacy of Hans Nielsen Hauge: Entrepreneurship in Economics, Management, Education and Politics* (217 p.). Bergen: Bodoni Forlag.
15. Hahn, R., Spieth, P., & Ince, I. (2018). Business model design in sustainable entrepreneurship: Illuminating the commercial logic of hybrid businesses. *Journal of Cleaner Production*, 176. <https://doi.org/10.1016/j.jclepro.2017.12.167>
16. Koilo, V. (2021a). Developing new business models: Logic of network value or cross-industry approach. *Problems and Perspectives in Management*, 19(2), 291-307. [https://10.21511/ppm.19\(2\).2021.24](https://10.21511/ppm.19(2).2021.24)
17. Koilo, V. (2021b). Evaluation of R&D activities in the maritime industry: Managing sustainability transitions through business model. *Problems and Perspectives in Management*, 19(3), 230-246. [https://10.21511/ppm.19\(3\).2021.20](https://10.21511/ppm.19(3).2021.20)
18. Krugman, P. (2009). How Did Economists Get It So Wrong? *The New York Times Magazine*. Retrieved from <https://>

- [www.nytimes.com/2009/09/06/magazine/06Economic-t.html](http://www.nytimes.com/2009/09/06/magazine/06Economic-t.html)
19. Liland, T. (2021). Hans Nielsen Hauge as a Social Entrepreneur and Innovator. *In the legacy of Hans Nielsen Hauge: Entrepreneurship in Economics, Management, Education and Politics* (217 p.). Bergen: Bodoni Forlag.
  20. Lüdeke-Freund, F., Rauter, R., Pedersen, E. R. G., & Nielsen, C. (2020). Sustainable Value Creation Through Business Models: The What, the Who and the How. *Journal of Business Models*, 8(3), 62-90.
  21. Moore, P. D. (2019). *In the digital world, technology is the primary source of value creation. Wild Oak Enterprises*. Retrieved from <https://woellc.com/technology-is-the-primary-source-of-value-creation/>
  22. Mulligan, T. M., & Gilbert, D. R. (1992). Review of Corporate Strategy and the Search for Ethics, by R. E. Freeman. *Journal of Business Ethics*, 11(7), 514-554. Retrieved from <http://www.jstor.org/stable/25072302>
  23. Nehohod, E. V. (2015). *Theory and practice of corporate social responsibility*. Tomsk: Publishing House of Tomsk State University. Retrieved from <http://vital.lib.tsu.ru/vital/access/manager/Repository/vtls:000518555>
  24. Norris, S., Hagenbeck, J., & Schaltegger, S. (2021). Linking sustainable business models and supply chains – Toward an integrated value creation framework. *Business Strategy and the Environment*, 1-15. <https://doi.org/10.1002/bse.2851>
  25. Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises. *Sustainability*, 11, 391. <https://doi.org/10.3390/su11020391>
  26. Parida, V., & Wincent, J. (2019). Why and how to compete through sustainability: a review and outline of trends influencing firm and network-level transformation. *International Entrepreneurship and Management Journal*, 15, 1-19. <https://doi.org/10.1007/s11365-019-00558-9>
  27. Patala, S., Jalkala, A., Keränen, J., Väisänen, S., Tuominen, V., & Soukka, R. (2016). Sustainable value propositions. Framework and implications for technology suppliers. *Industrial Marketing Management*, 59, 144-156.
  28. Porter, M., & Kramer, M. (2006). Strategy & Society: The Link between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review*, 84, 78-92.
  29. Porter, M., & Kramer, M. (2011). Creating Shared Value. *Harvard Business Review*, 89, 62-77.
  30. Sadowska, V., Ekelund Axelson, L., & Mark-Herbert, C. (2020). Reviewing Value Creation in Agriculture – A Conceptual Analysis and a New Framework. *Sustainability*, 12, 5021. <https://doi.org/10.3390/su12125021>
  31. SFI MOVE. (2018). *Annual report. Marine Operations in Virtual Environments* [www.ntnu.edu/move](http://www.ntnu.edu/move) *Annual Report 2018 SFI MOVE Marine Operations in Virtual Environments*. Retrieved from [https://www.sintef.no/globalassets/sintef-ocean/factsheets/sfi\\_move\\_arsrapport\\_2018.pdf](https://www.sintef.no/globalassets/sintef-ocean/factsheets/sfi_move_arsrapport_2018.pdf)
  32. Sommer, A. (2012). *Managing green business model transformations*. New York: Springer. Retrieved from <https://pdfroom.com/books/managing-green-business-model-transformations/RPkdNnmGdXr>
  33. Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2009). *The Measurement of Economic Performance and Social Progress Revisited – Reflections and Overview*. Commission on the Measurement of Economic Performance and Social Progress. Retrieved from [www.stiglitz-sen-fitoussi.fr/documents/overvieweng.pdf](http://www.stiglitz-sen-fitoussi.fr/documents/overvieweng.pdf)
  34. Stubbs, W., & Cocklin, C. (2008). Conceptualizing a 'sustainability business model. *Organization and Environment*, 21(2), 103-127
  35. Yang, M., Evans, S., Vladimirova, D., & Rana, P. (2017). Value uncaptured perspective for sustainable business model innovation. *Journal of Cleaner Production*, 140, 1794-1804. <https://doi.org/10.1016/j.jclepro.2016.07.102>