3 Reindeer Herders in Arctic Supply Ecosystems

Searching for the Harmony between Value-Creation and Value-Capture

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Introduction

Contemporary supply chains are inherently complex and have often been conceptualized as networks (Carter et al., 2015). Introducing the term "network" in the supply chain management (SCM) field has therefore extended our understanding of the SCM concept from a strategic perspective (Mills et al., 2004). Indeed, the actors in the supply chain are highly connected logistically, informationally and financially. It is often said that competitive advantages are provided not only between companies and manufacturing but within supply chains and networks (Mills et al., 2004). However, recent studies have demonstrated that government interventions and institutional and contextual factors substantially affect supply chain practices (Tsvetkova and Gammelgaard, 2018). In this study, we argue that we are witnessing another conspicuous shift in the conceptual focus of management – from networks toward ecosystems. This shift reflects the increasing interdependence, interaction and co-evolution of business activities, actors, technologies and institutions, therefore demanding a different theoretical and empirical approach than commonly adopted in network studies. Ecosystem members pursue dual goals of cooperation to create value and competition for scarce resources, to capture value (Ketchen et al., 2014; Hannah and Eisenhardt,

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2018). However, the interplay of both goals may make it difficult to achieve a balance between value-creation and value-capture, especially over time; that is what is still lacking in our understanding and why a thorough examination is called for (Hannah and Eisenhardt, 2018), particularly at the operational level.

Arctic oil and gas field projects are inherently complex communities of specific interactions and interdependencies among different actors involved both upstream and downstream. They represent distinct ecosystems that have recognizable institutional boundaries within which operations take place. The Arctic provides unique empirical settings where manufacturing and supply operations are challenged by extremely harsh climatic conditions, remoteness, sparse transportation links with other regions and global markets, and a limited number of suppliers and logistics providers. While technological advances have driven significant breakthroughs in the oil and gas industry, making their operations smoother and better thought out, they may also drastically affect the natural environment. Value-creating activities within oil and gas supply chain operations include not only ensuring regular deliveries of cargoes for manufacturing needs and their customers but also extra support regarding the safety of operations and local settlements in extremely remote Arctic areas (Tsvetkova, 2020a). However, collaborative relationships among ecosystem actors can be overshadowed by the competition for limited resources and profits that takes place within these relationships. It seems that there is a lack of knowledge of value-creating implications when companies transition from a traditional supply chain environment to surviving and thriving within an ecosystem.

By taking into account the contributions of various actors toward achieving shared-value outcomes, this study seeks to examine the interplay between value-creation and value-capture in supply ecosystems. Of particular interest is *how SCM practices under Arctic extreme environments have been continuously (re)shaped by the complex and evolving interactions between oil and gas businesses and Indigenous reindeer herders where the latter are impacted by the oil and gas ecosystem.* In doing so, a single case study approach is employed to showcase a supply ecosystem that originated from the onshore oil and gas field operations located on the Yamal Peninsula. This ecosystem, comprising multiple actors, technologies and institutions, was selected for its ability to enable value-creation activities by absorbing and integrating diverse operations, even in the presence of competition and the need for value-capture.

The study proceeds as follows: the next section outlines our research method. This is followed by presenting our empirical case, with the findings discussed thereafter. The study concludes with theoretical and practical implications and guidelines for future research directions.

Method

Research Design

A qualitative, single case-study approach was chosen to explore the facilitation of value-creating activities within an ecosystem of Arctic oil and gas field

operations. It took as its point of departure an oil and gas field located on the Yamal Peninsula. This field has been developed by one of the world's largest oil companies (hereinafter, the focal company) under extremely natural conditions and a lack of infrastructure. The supply chain practice of this field was chosen for its role in the evolution of an ecosystem, including multiple actors, technologies and institutions, and in facilitating value-creation activities by absorbing and managing diverse operations.

This approach allowed us to investigate our phenomenon in its natural setting (Barratt et al., 2011), interpret the processes "in terms of the meanings people bring to them" (Denzin and Lincoln, 2005) and generate insights gained through the deep observation of real-life practice (Voss et al., 2002).

Data Collection

We used multiple data sources, as recommended in previous SCM research (Voss et al., 2002). Data were collected over a nine-month period in 2021 and 2022 using ten semi-structured and in-depth face-to-face interviews, eight telephone interviews and focus group discussions with key informants engaged in developing the Arctic oil and gas field, supply operations and the transportation of goods. Focus group participants and interviewees were selected through purposive sampling from different work positions – site and operator managers, equipment managers, terminal operations managers and representatives of Indigenous Peoples, as well as oil tanker administrators. They were chosen based on their long experience, practical knowledge and many years of involvement in developing oil and gas projects and ecosystem-related activities in the extremely harsh conditions of the Russian Arctic. This wide range of representatives of various professions allowed us to gain a comprehensive understanding of how ecosystems evolve around the development of Arctic oil and gas projects, and how value-creating activities are carried out, despite ecosystem members capturing value for limited resources and the associated profits.

The semi-structured interview method was chosen since it encouraged our interviewees to reflect and elaborate on the challenges and peculiarities of supply chain operations in extremely low temperatures and ice-infested waters and the discussed ongoing concerns, which led to deeper insights into the observed phenomenon. Lasting between two and three hours, these in-depth interviews were recorded on paper forms and as digital audio files with the consent of the interviewees, transcribed and validated with key informants in order to ensure the reliability of our findings. The interviews were conducted in Russian and then translated into English. When necessary, follow-up interviews with additional questions were conducted via email. The names of interviewees and companies were omitted to comply with ethical issues. The focus group discussions included a total of eight participants and were designed to follow up the preliminary outcomes obtained from the semi-structured interviews.

Our findings were supported by personal observations that enabled us to describe the real-life practice of supply ecosystems in the Russian Arctic. A certain amount of empirical data was collected during a trip onboard a container vessel of ice-class Arc7 (undertaken by the second author) on its regular voyage from Murmansk port to Dudinka port in the period 28 April to 6 May 2016. Personal observations were also made during a trip onboard the offshore service vessel (undertaken by the second author) on its regular voyage from the supply base to the offshore installations in the Norwegian Sea (between 4 and 6 March 2020). Although the waters of the Norwegian Sea are not ice-infested, this trip helped collect data on how service vessels participate in supporting oil field development and carry out loading/unloading operations in stormy winds and high waves. Further, our findings were supported by the working experience of the first author as an expert in supervising oil and gas activities in the Sea of Okhotsk, which is a so-called sub-Arctic area characterized by hurricanes, prolonged blizzards, severe storms, typhoons and harsh ice conditions. All the co-authors also made personal observations during several visits to the interviewees' offices. These data sources allowed the observation of the decision-making process by senior managers to witness their actual daily interaction in operational activity. Being careful observers and good listeners, we maintained a non-judgmental attitude and openness to the unexpected in what was learned.

Additionally, secondary data were primarily collected from the companies' documentation, press releases, internal archival materials and websites, as well as reports from relevant government authorities and independent agencies. Using different types of data sources allowed for data triangulation, thereby increasing the data's internal consistency and the validity of our research findings (Voss et al., 2002) and establishing a chain of evidence, as described by Yin (2009).

Data Analysis

One of the most crucial challenges behind data analysis in single case studies is demonstrating the objectivity of the process through which the empirical data and notes are developed into conclusions (Eisenhardt, 1989). In line with this, we employed thematic synthesis analysis, which allowed for greater flexibility in the coding process for identifying, analyzing and reporting patterns within our data. This method also describes the data set in rich detail and frequently interprets various aspects of the research topic. So, it was helpful to examine the experience, meanings and reality of case participants, as well as the ways in which events, realities, meanings, experience and other aspects affect the practice (Cruzes et al., 2015).

In the first stage, we provided a case description of supply chain operations within the Arctic oil and gas project and then delineated emerging constructs and their relationships related to value-creating activities and value-capture

among the ecosystem members. Thus, we were able to move iteratively and abductively between previous research and the empirical material. This means that we kept revising and refining interview templates, informed by both insights from previous interviews and data obtained during personal observations, as well as by continuous reading of the literature (Braun and Clarke, 2006). In the second stage, we identified specific segments of interview transcripts and created a list of tentative themes. We also adopted themes from extant literature. Then, we reduced the overlap and translated the 12 codes into the following six themes: supply operations, maritime transportation, value-creating activities, value-capture, Indigenous People and food delivery. This allowed us to create a first-order coding scheme that continually changed. While our understanding of the empirical case grew, the coding scheme was revised and refined. In the last stage, we created a model of the final coding themes, in which we mapped the six themes into three higher-order themes: integration, adaptation and co-existence. The strength of the final coding scheme was based on the number of times mentioned by our interviewees.

Case Presentation: The Oil and Gas Ecosystem Affecting Reindeer Herders

Ecosystem-Building Mechanisms

Contextual Settings of the Russian Arctic as Prerequisites for Innovative Technologies

The focal company's oil and gas field is located in an extremely remote northern Russian area on the Yamal Peninsula. Recoverable reserves are estimated at over 250 million tons of oil and condensate and over 320 billion cubic meters of gas. However, the absence of transport infrastructure, coupled with the complex underlying geology and multiple technical issues, e.g., tectonic abnormalities leading to significant fragmentation of deposits, remain insurmountable obstacles to the field going into full-scale development.

Its location in the Russian Arctic implies serious contextual challenges, such as extreme remoteness, long distances, severe Arctic climate, polar night, sparse transportation networks and lack of transport infrastructure (Tsvetkova and Gammelgaard, 2018). The field lies 200 kilometers from the nearest railway line, more than 700 kilometers from the nearest road, 360 kilometers from the nearest town, and 30 kilometers from the Gulf of Ob. These challenges made the feasibility of this field project critically problematic to implement and meant the focal company was isolated from its customers, global markets and other regions. As a result, the focal company faced one of the most baffling and strenuous logistical undertakings in the entire history of the Russian oil and gas industry. As emphasized by a senior manager:

> *The field was discovered more than 50 years ago. But, unfortunately, the lack of technologies allowing us to develop such a complex field and – what is most important – the lack of a scheme for the export of finished oil from this field did not allow us to start its development.*

Thus, one of the most substantial challenges was the field's extreme remoteness from transport infrastructure. The focal company's main operational and strategic concern was finding a route for the shipment and transportation of crude oil from the field to the market in northwest Europe. Regular supply deliveries to the field and the shipping of oil from the field matter to the focal company's manufacturing operations and infrastructure.

Development of Transport Infrastructure

In 2012, full-scale development of the field began with the ensuing production of the first 6,000 tons of crude oil. As a senior manager stated:

> *In those days, when the project had just begun to be developed, there was nothing here, only an empty field ... Only endless tundra stretched thousands of kilometers, and here and there reindeer roamed. No roads, no paths. At first, living conditions were utterly harsh because, in these areas, the temperature drops to –60 degrees in winter, and everything is buried in snow for 245 days per year.*

The first oil shipments were carried out by trucks, using 200 kilometers of winter ice roads to the nearest railway station, and then they were transshipped into railway tanks to be transported about 800 kilometers to a refinery plant. A senior manager explained:

> *In such a way, we could transport only 12,000 tons of oil. It was an experimental scheme for us. We used it as it required the least investment. However, firstly, the throughput of this option was minimal. Secondly, the tundra becomes impassable in the summertime.*

Experts considered 20 options for oil delivery, which were mainly based on the construction of pipelines to the nearest railway or refinery plant and sea terminals located at a distance of several 250 to 500 kilometers. All these options meant a huge distance. Further, each of the 20 options had its own difficulties. So, over time, experts came up with the idea to transport oil by sea. In parallel, a pilot voyage of the Vaygach icebreaker was undertaken, in order to check the navigability of the Gulf of Ob during challenging ice conditions and confirm the possibility of transporting oil from the field by sea. Climatic conditions of the Gulf of Ob are characterized by harsh parameters, such as –25°C in February (with absolute lowest –56°C), ice depth of up to 2.5 meters

and ice-free navigation for approximately 85 days per year. As emphasized by a senior engineer:

> *In the Gulf of Ob, fresh ice is stronger than sea ice. Nevertheless, the icebreaker successfully traversed the challenging ice conditions and thereby proved maritime transportation to be the most effective for oil shipping. This was the first experience of working with the state provider of icebreaker services, and it was positive.*

From the point of view of maritime logistics, the most attractive and convenient option was the terminal in Kharasavey, located more than 250 kilometers from the field. This terminal opened a route directly to the port of Murmansk. Thus, oil tankers would voyage for just two days, creating value for customers. However, this option could cause a social conflict of interest with Indigenous Peoples. As a senior manager explained:

> *We would have to build a pipeline with a length of more than 250 kilometers, and it would cross the entire Yamal Peninsula. This option would affect the roaming paths of reindeer and the Indigenous Peoples following them. For reindeer and Indigenous People to cross a pipeline is an unfeasible obstacle that could lead to hunger for the reindeer and their extinction. We would have to make numerous changes to the pipeline design, which is costly and a considerable challenge.*

Despite the seemingly high level of efficiency, the company had to abandon this option.

Indigenous People: Traditional Lifestyle at the Center of Business Ecosystem

The Nenets people are the keepers of the ancient culture, who obey the biorhythms of their reindeer herd. They have adapted to be able to live and travel in freezing temperatures. The annual reindeer migration sees over 650,000 reindeer and over 18,000 of the Nenets people who herd them traveling up to 1,000 kilometers across the Yamal Peninsula (see Figure 3.1). During the winter, when temperatures can plummet to –50°C, most Nenets graze their reindeer on moss and lichen pastures in the southern forests. Then, every spring, the Nenets move these enormous herds, which range from 500 to 7,000 reindeer, from winter pastures on the Russian mainland north to summer pastures over the Polar Circle to the shore of the Kara Sea. The northern pastures, rich in tasty lichen and saltwater, which are exceptionally useful for these animals, are waiting for them. Seasonal migrations are necessary, reindeer herders say, as they help prevent the depletion of reindeer pastures and let the animals gather strength before the long polar winter. This massive journey usually starts in

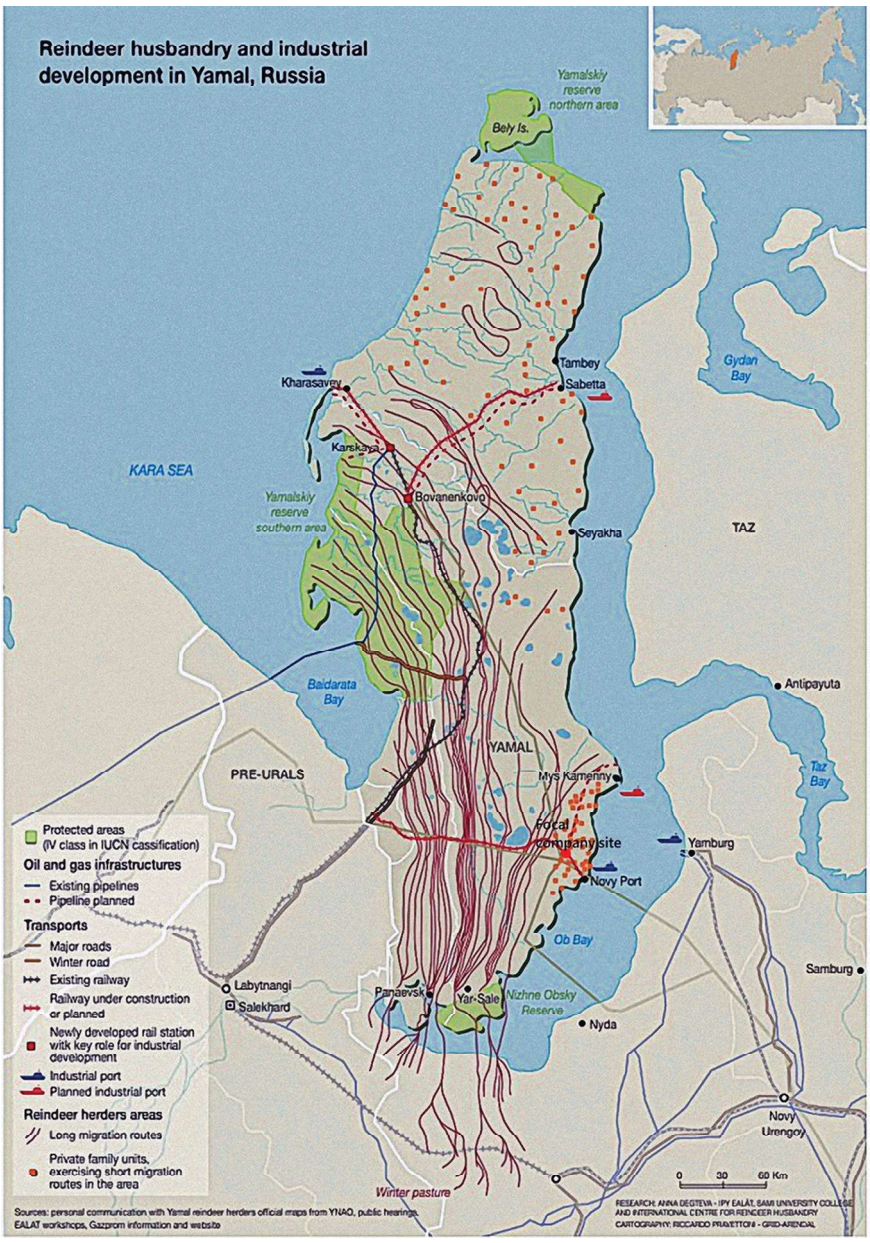

Figure 3.1 General migration routes of reindeer herds and major infrastructure on the Yamal peninsula (*Source*: Degteva and Nellemann, 2013).

mid-March, when temperatures are still freezing, because part of the journey involves crossing a vast expanse of the Ob River. It is worth adding that seasonal migration routes have not changed for centuries.

However, in the early 2000s, this land became the center of the strategic interests of the focal company. The extensive network of pipelines, roads and electrical lines has crisscrossed the Arctic tundra, a treeless expanse that became an insurmountable barrier for reindeer to travel across hundreds of kilometers. The question arises as to why it is impossible for reindeer to choose another way. At first glance, this does not seem to be a problem; after all, this industrial oasis is surrounded by untouched tundra. As clarified by one Indigenous representative:

> *The Nenets' livelihood is tied to the reindeer. There are other reindeer herders. If one family of reindeer herders is forced to change its centuries-old migration patterns, other herders have to leave their habitat. In this case, there will not be enough pastures. The Nenets' survival depends on reindeer migration in the tundra, and they cannot live without it. We often joke about who grazes whom – do people graze reindeer or, on the contrary, do reindeer graze people?*

Additionally, the Nenets' survival is threatened not only by the development of oil and gas fields but also by climate change. As temperatures rise and the tundra's permafrost thaws and releases greenhouse gases into the atmosphere, the ice melts earlier in spring and does not freeze until much later in autumn. The rising temperatures also affect the tundra's vegetation, the only source of food for the reindeer. Therefore, the Nenets have to struggle to survive due to climate change and industrialization of their land.

Ecosystem-Based Value-Capture Mechanisms: In Search of Innovative Logistics Solutions

The focal company's production sites are adjacent to the territories of the Nenets, who have been living on this land for many centuries. The construction of a vast pipeline system for oil shipping would set a barrier to reindeer migration by dividing the winter pastures into two. Further, the major facilities of the field have already affected migration patterns and transformed a fragile environmental community. As a senior manager reported:

> *We respect the traditions of Indigenous Peoples. Preserving the traditional lifestyle of these people of the North is among the fundamental principles of field development in the Yamal Peninsula.*

Although the option of the 250-kilometer pipeline construction to the terminal in Kharasavey and then maritime transportation directly to Murmansk port was the least costly option and allowed the time for the shipping of oil to customers to be minimized, the focal company decided to choose maritime

transportation through the Gulf of Ob. This option was quite costly, arduous and carried numerous risks. It included the construction of a pipeline 100 kilometers long to the coast of the Gulf of Ob, where subsequent loading onto oil tankers would be fulfilled. The focal company faced numerous challenges, such as the Gulf of Ob being free of ice for less than three months, fresh ice being much stronger than sea ice (thickness up to 2.5 meters), constant alluvial currents, shallow waters of 12 meters' depth and sea tankers unable to come closer than 3.5 km from the coast. Due to these challenges, siting the terminal onshore proved impossible. However, one indisputable condition was that it had to operate all year round, although maritime logistics specialists doubted this was possible in principle.

During summer navigation 2014, the first shipment was made, aligned with the offloading of oil from the oil delivery and acceptance point to the river tanker with a low draft by hose, then transportation to a larger sea-going tanker and, finally, the "berth-to-berth" offloading of oil from the river tanker to the sea-going tanker to be delivered to Murmansk port. More than 101,000 tons were shipped under this scheme in 2014. Later, during winter navigation 2015, a temporary scheme was tested through the so-called ice pier, with the shipment of more than 112,000 tons of oil. Both options marked a breakthrough in the development of Arctic SCM practices. However, the volume of oil production grew in colossal proportions. As a senior manager reported:

> *Those temporary schemes based on offloading by hose and river tankers proved ineffective – first of all, because they could not be used in the offseason. Besides this, we could not claim that these logistics methods were safe and secure. There was a high risk of oil spills, which possibly needed to be prevented. We carefully tried to avoid every fault. From the very beginning, we made it a prerogative that ecology and safety were our priority in developing this field. Therefore, we put in a lot of effort and involved experts in finding an effective solution.*

Ultimately, in 2016, the focal company came up with an innovative decision to install a tower-type Arctic loading terminal as a single-point mooring at a distance of 3.5 km offshore, where large crude tankers could be loaded safely (see Figure 3.2). Oil from the production sites reached the central gathering point on the coast of the Gulf of Ob, through a pipeline more than 100 kilometers long and, subsequently, the terminal, through an underwater pipeline 3.5 km long. Transshipment capacity at the Arctic loading terminal allowed up to 8.5 million tonnes of oil per year. Further, the choice made in favor of the Arctic loading terminal ensured stringent environmental and industrial safety standards (Fadeev et al., 2021) and the application of "zero-emissions" technology that eliminated any risk of contaminants reaching the waters of the Gulf of Ob.

The focal company also invested in building its own icebreaker fleet to service the field project, including six Arc7-class tankers and two diesel-electric

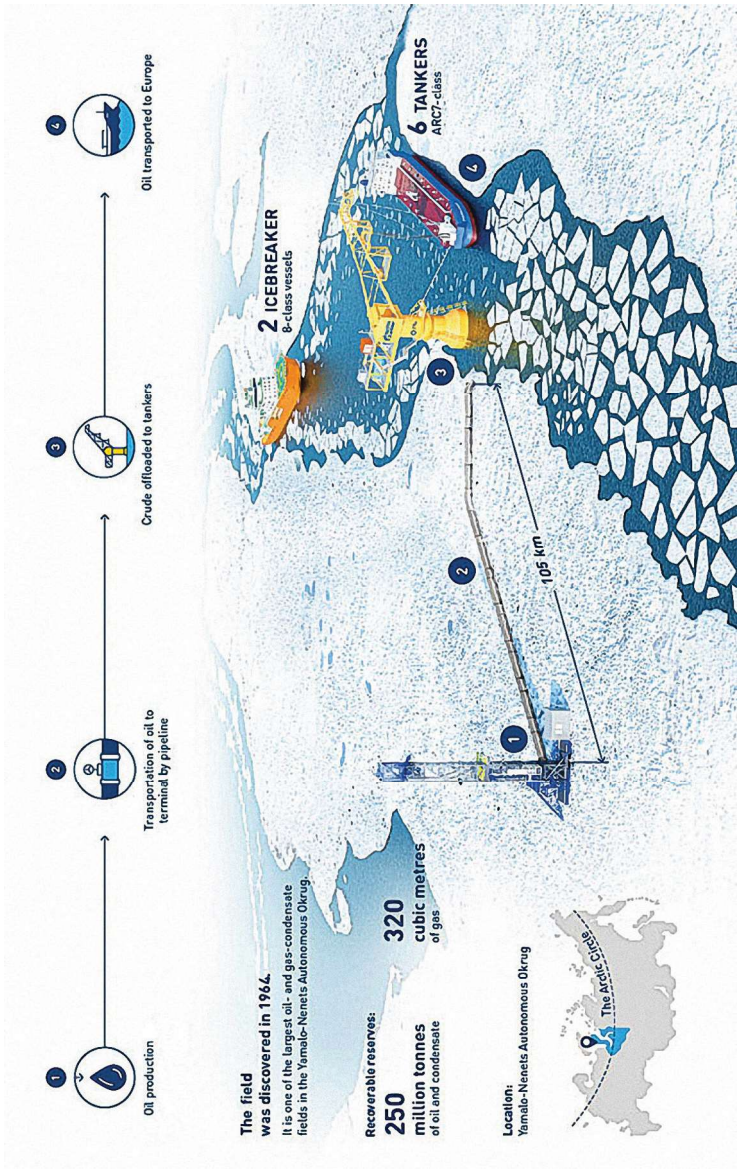

Figure 3.2 Oil offloading via the sea terminal in the Gulf of Ob (*Source:* "GazpromNeft-Supply" Ltd).

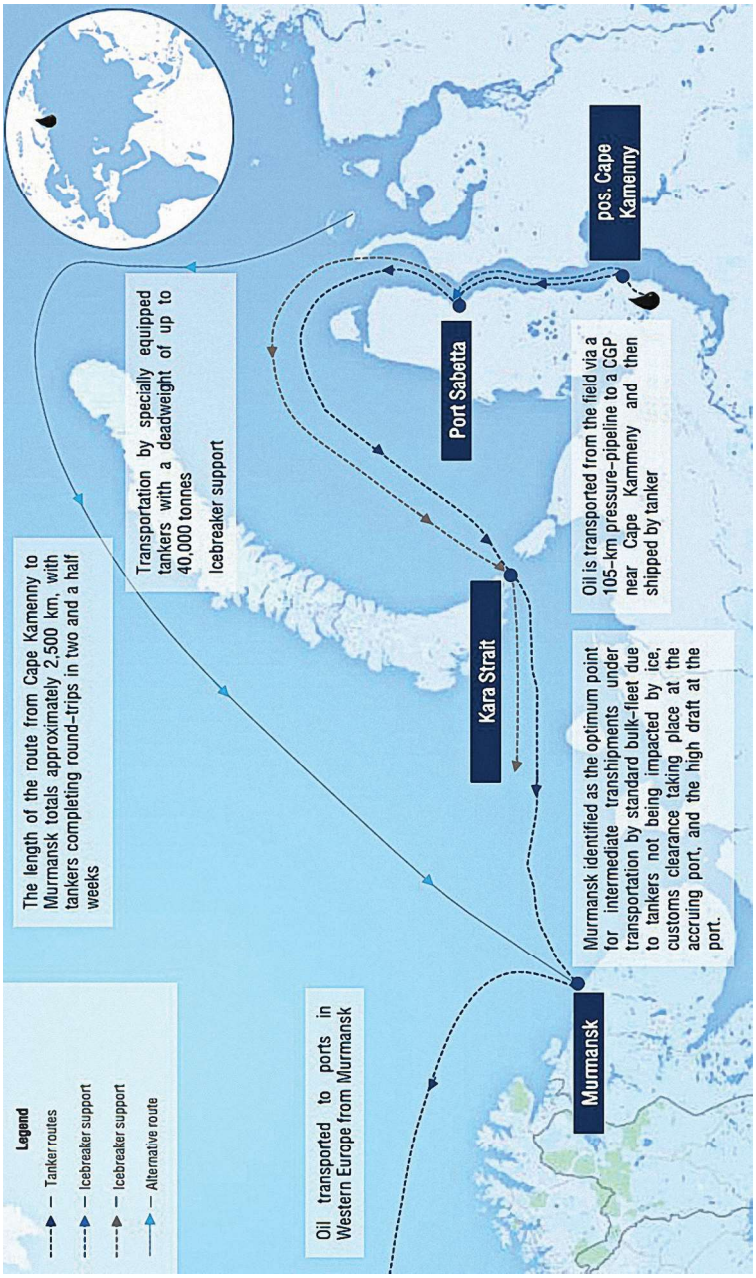

Figure 3.3 Oil transportation from the field to the customers (*Source:* "GazpromNeft-Supply" Ltd).

icebreakers. These tankers have a cargo-bearing capacity of 42,000 tonnes and a maximum draught of 9.5 meters, enabling them to operate at shallow depths in the freshwaters of the Gulf of Ob. Also, they can independently negotiate ice of 1.4–1.8 meters' thickness and are equipped with turret-type terminal crude bow-loading equipment. Both icebreakers are designed to support tankers, can operate independently for 40 days at temperatures as low as −50°C and can accelerate to up to 16 knots (30 kilometers per hour) in open waters. Moreover, thanks to their steerable propellers, they can complete a full turn within a minute, while their 22-MW propulsion power provides icebreaking capacity of up to two meters, comparable to that of nuclear icebreakers.

Thus, making concessions so as not to create additional obstacles, through the construction of a new pipeline, to the migration of Indigenous Peoples and reindeer, the focal company had to elaborate innovative logistics solutions that required colossal capital investments and technological breakthroughs (Fadeev, 2022). Despite the multiple challenges faced, it was, however, recognized that these technologies and solutions enabled eventual value-capture to ensure highly integrated competence. At the same time, it is worth noting that the focal company's choice was not helpful in utilizing shorter delivery times to create value for customers.

Ecosystem-Based Value-Creation and Adaptation Mechanisms: Reindeer Herders and Logistics Infrastructure

Finding a Balance of Interests

Close proximity to Indigenous Peoples, the so-called "masters" of the Arctic, made the focal company find a balance of interests. Therefore, it was decided to take into account the interests of both parties when equipping the field project. As an engineer told us:

> *At that place… [pointing to the side], for example, we overlanded the pipeline. Farther, there is a butanol pipeline, which goes underground at the place where reindeer herds cross it. This is important because reindeer are afraid of gas noise... [laughs]… reindeer are very capricious animals and react sensitively to many factors of artificial influence. Today, there are 22 crossings in total. But while the field is growing, there are discussions about organizing new crossings. So, "horned travelers" bring their own correctives to the field architecture. It turns out that we, oilmen and reindeer herders, are jointly protecting the Arctic's fragile ecosystem.*

So, industrial cables and pipelines that cross migration routes were laid in special U-shaped passages and underground if possible due to permafrost. Since then, oilmen and Indigenous People have met twice per year.

Preparations for reindeer migration are made in advance. The local commission, comprising representatives of the municipal reindeer herding

enterprise, the Yamal public movement of the Indigenous minorities of the North, and the focal company's professionals, checks the condition of the existing crossings and defines the cooperation procedure. For the migration period, sections of motor roads are covered with a special geotextile fabric called dornit, which makes it possible for the sleds to glide easily without damaging the sled runners. The traffic is halted until reindeer herds and numerous loaded sleds finish the crossing. As a senior manager emphasized:

> *Ensuring safe conditions for the migration (passage) of reindeer herds through production sites is among the environmental targets successfully addressed by our company.*

Today, this solution makes it possible for reindeer to freely walk across the tundra toward the Kara Sea and back, using their traditional routes and, thereby, enhancing value-creation for Indigenous People.

Establishment of Trading Posts and Other Benefits of Industrial Supply Chains

The delivery of equipment, engineering facilities, building materials and food to the oil and gas field is carried out initially by rail to the station 200 kilometers away and then by road, which is possible only through winter roads. Winter roads must be built each year and function for a few months per year. In Russia, such connections (usually called "ice roads") often take the form of river ice crossings in the treeless tundra. In addition, these winter roads serve as a vital supply link for remote northern settlements located in close proximity to the field.

The focal company demands high standards regarding transport, technical means and drivers' experience. However, the 200 kilometers of the winter road are tough to maintain in good condition. Harsh natural conditions make their own adjustments. As a driver who has been working on this route for more than ten years stated:

> *The winter road is essentially the absence of a fully fledged road, a roadway. A special difference of a winter road in this area is the wind. I have never seen such a wind of 30 to 45 meters per second anywhere. Even though the winter road is cleaned from time to time, the weather conditions change very quickly – whether snow, wind or sun. The most frequent occurrence is an intense snowstorm when it sweeps over the tundra two meters high, and visibility is only up to two meters. Snowdrifts rule here... Trucks get stuck in fluffy snow. Have you ever seen how trucks trample the track in the snow? Here, particular skills are needed to make your way – awesome filigree work. The wind drives the snow, the drivers wave their shovels, and the cars barely move in an hour... Often, you can find trucks fallen into a swamp, river ice, or driven over to the side of*

> *the road. It's scary... especially when this happens every 10 minutes... Deadly factors are drivers' lack of sleep and fatigue, as well as weather conditions.*

At the same time, substantial and extremely heavy cargoes are delivered only by water during summer navigation, and their unloading is carried out in two nearby settlements.

Meanwhile, winter roads have made it possible to create 17 trading posts in this region, with the support of local authorities. Every year, about 22,000 people who roam with reindeer are served at trading posts, and an average of 1,500 tons of products from the traditional activities made by Indigenous Peoples of the North are harvested – fish, wild plants, reindeer antler products. Also, bread is baked directly at the trading posts. In addition to their primary functions, some trading posts provide social services and medical care, where the permanent work of paramedics is organized, and there are adapted premises for medical stations. As one of the tundra residents stated:

> *Our family always visits local merchants at trading posts. Typically, they stand on the deer migration routes, and there are slaughterhouses nearby, where we send deer for meat. So convenient! Here we buy mainly food products that end up in our raw-hide tent, also tarpaulin, colored cloth, lamps, reindeer harness equipment and other goods needed in the tundra. Generally, the generator often fails. So, we have to buy parts.*

However, delivering foodstuffs and all the necessary provisions for tundra residents is very challenging. As one of the local merchants told us:

> *Trucks usually drive along the winter road from seven up to twelve days. The problem is that food deliveries can happen once a year in winter. We listen to Indigenous People's wishes/orders and try to bring these new things that people want. It is pretty common for tundra residents to have no money to pay for food products. Here, almost like in a communal system… [laughs]... it is not monetary but often commodity settlements that are accepted. Reindeer herders bring fish, meat and deer antlers here – this is the hardest currency of the tundra, although local natives often complain that they are paid little for horns in contemporary times.*

Annually, reindeer herders can bring up to 1.5 tons of deer antlers to such a trading point. Trading posts are indeed a kind of saving oasis for the inhabitants of the Russian High North.

Another aspect of obtaining value was the railway, built primarily for the needs of the oil and gas industry on the Yamal Peninsula. All expenses for the construction of the railway were borne by the company, and the authorities provided administrative support for the project. Reindeer herders roaming the tundra on reindeer teams quite organically fit this road into their traditional way of life. The railway in all seasons has become an attraction for raw-hide

tents – both nomadic and stationary. Often, when train carriages crawl through, you can see a picture of herds crossing the railway embankment against the backdrop of visible raw-hide tents. In some places, reindeer herders cross the railway, passing with reindeer under bridges. Further, reindeer herders and their families actively use the railway for daily needs. The railroad became a driver for the mobility of both the nomadic Indigenous Peoples and their belongings. Thanks to free transportation, some reindeer herders have organized food traffic from towns to the south, where prices are much lower. The luggage limit is 100 kilograms per person. Also, there is more convenient access to medical care, not dependent on reindeer, snowmobiles or helicopters. One of the most significant changes associated with building the railway is the increased mobility of women, children and also the elderly of the Indigenous Peoples of Yamal.

Surprisingly, reindeer herders often do not link the benefits of logistical infrastructure and the establishment of trading posts with the development of oil and gas fields on the Yamal Peninsula. On the contrary, there is a steady understanding among local reindeer herders that nothing good comes from the gas workers. Still, they respond very positively in relation to the railway. Further, this railroad also created a sense of inequality between the nomadic tundra inhabitants close to the new transport infrastructure and those whose reindeer migrated far away from it, closer to the focal oil and gas field. It is noteworthy that nomadic reindeer herders in conditions of extremely limited transport infrastructure, e.g., this railway, have a fairly low level of adaptability to the conditions of settlements and towns, as their communication skills are more deficient.

Discussion

According to Jacobides et al. (2018), a business ecosystem refers to a group of interacting entities that depend on each other's activities. So, this emphasizes the fact that the environment presents "common adaptive challenges to organisms" (O'Neill et al., 1986, p. 21), in which actors not only coordinate activities but also share these adaptive challenges with each other (Ketchen et al., 2014) and depend on each other for their mutual effectiveness and survival (Iansiti and Levien, 2004). Thus, organizations in such ecosystems have to adapt to contextual conditions that, in turn, can make them reconsider their core competencies, as well as the role of SCM practices (Tsvetkova and Gammelgaard, 2018).

Based on our empirical case study, we have discovered that actors within ecosystems, such as the focal oil and gas company and Indigenous reindeer herders, exhibit both independence and interdependence with one another. This relates to an essential characteristic of ecosystems: they help coordinate interrelated organizations with a large degree of autonomy. In line with this, they need to collaborate to create value and capture value, thereby creating "coopetition" (Ketchen et al., 2014; Hannah and Eisenhardt, 2018). Although

each member's activity is related to the others' activity and the entire ecosystem as a whole, each member (in our case, the focal oil and gas company and Indigenous reindeer herders) has to compete for resources that can be extremely limited.

For the focal oil and gas company, consideration of reindeer migration paths undermined the company's value-capture capacity for itself. Reindeer migration paths appeared to be a bottleneck in the development of a transport system for exporting oil to the market. This finding is consistent with Ritala et al. (2013) that value-capture predominantly refers to individual actor-related activities; that is how actors strive to reach their own competitive advantages and reap benefits. However, within the framework of ecosystem interaction, the focal company managed to overcome this bottleneck by implementing innovative technologies and new logistics solutions. In this way, the company created value and ensured its growth for Indigenous herders, while capturing value and creating profits. So, we have observed so-called coopetition that implies a synergetic aspect of relationships, which in turn distinguishes ecosystems from ordinary networks (Ketchen et al., 2014). In the ecosystem studied, coopetition was seen as a prerequisite for ensuring a diverse set of value-creating activities for the actors involved. In this regard, this finding fills the gap in our understanding (still missing in literature) of how the leading company can disperse these bottlenecks by balancing competition for northern land on the Yamal Peninsula and cooperation to align synergies between other members of the ecosystem (see Hannah and Eisenhardt, 2018; Jacobides et al., 2018).

Ecosystems encompass more than just business networks; they comprise systems of actors, technologies and established practices that co-evolve through their interactions, joint contexts and shared purpose (Aarikka-Stenroos and Ritala, 2017). Not only can actors belong to multiple ecosystems simultaneously (Aarikka-Stenroos and Ritala, 2017), but they may also have distinct institutional effects and indirect butterfly effects on value-creation (see Lacoste, 2015). By tracing the goals and actions of the ecosystem's main actors (see Figure 3.4), we identified mechanisms for cooperation and value-creation, as well as mechanisms for competition and value-capture. Unlike previous studies (Adner and Kapoor, 2010; Pera et al., 2016; Meynhardt et al., 2016), we examined these mechanisms holistically, without segregating them. Our findings demonstrate that value-creation and value-capture are closely intertwined. The focal oil and gas company captures a portion of the value created by the ecosystem through its industrial expansion, the development of own transport infrastructure and enhanced expertise. In turn, the Indigenous reindeer herders capture a portion of the value created by the ecosystem by utilizing transportation services constructed by the oil and gas company for its own use, thereby ramping up their mobility and preserving their land and traditional ways of life. However, the interplay between value-creation and value-capture in the supply ecosystems is not always straightforward. Our

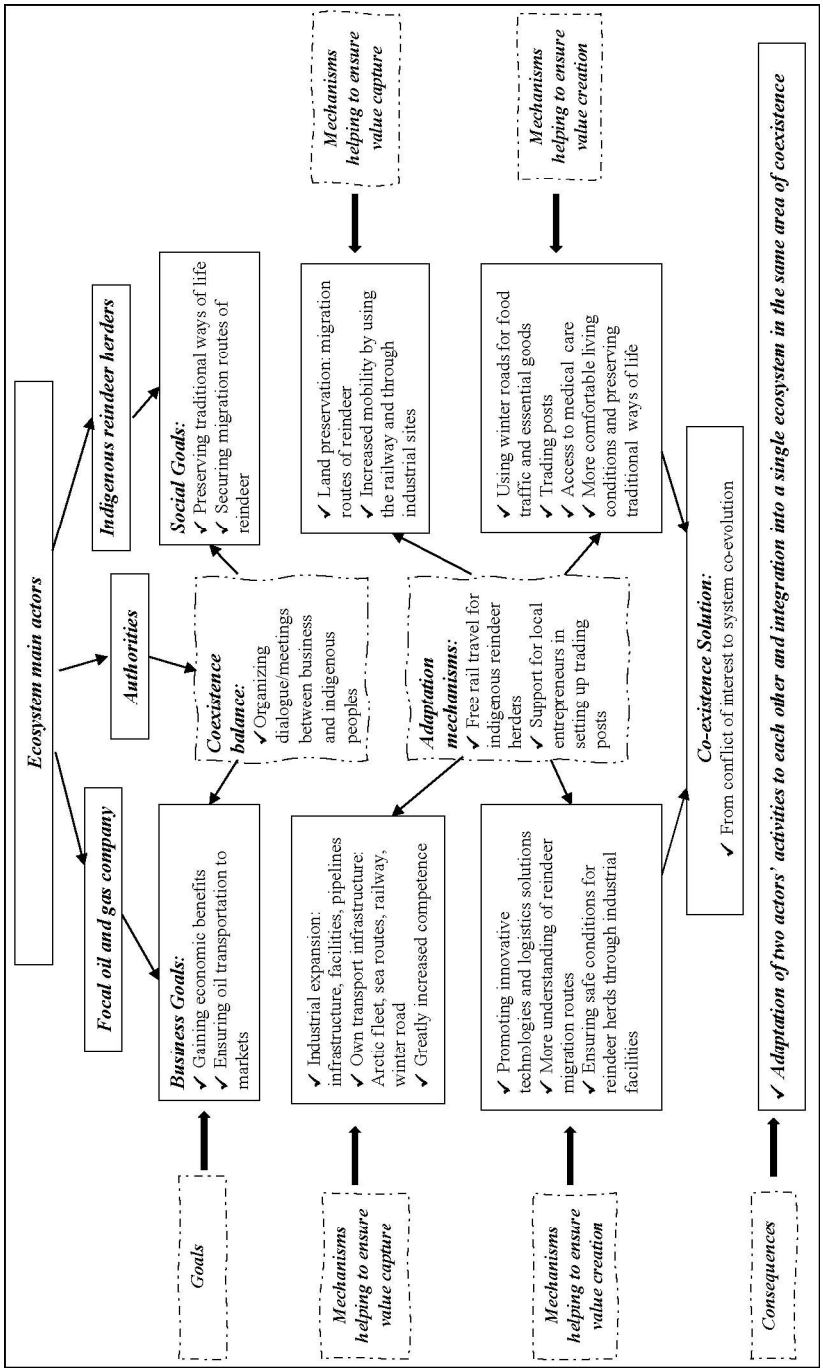

Figure 3.4 Ecosystem-building and management mechanisms (*Source*: the authors' elaboration).

empirical case reveals that the development of new transportation routes in the Arctic region can result in social contradictions and unforeseen consequences for Indigenous communities. Therefore, our findings indicate that the value created by the ecosystem may not be distributed fairly among the various actors, leading to tensions and conflicts.

Furthermore, it is worth noting the role of authorities in ensuring a balance between business and social objectives by implementing adaptation mechanisms for Indigenous reindeer herders. Notably, respondents from the business side highlighted the authorities' lack of influence and involvement, while representatives of Indigenous Peoples were more accepting and recognized the authorities' role as crucial. Nevertheless, the authorities' efforts contributed to the emergence of a new co-existence solution, which has permeated the societal fabric or, in other words, the entire ecosystem. The co-existence solution shifts the focus away from the conflict of interest between the main actors toward system co-evolution through interactions and joint contexts. This new phenomenon facilitates the fair and equitable distribution of value created within the ecosystem among all actors involved. Our findings have uncovered the integration of demand in supply ecosystem management and the development of social responsibility practices that take into account the needs and interests of all actors in the ecosystem.

While the SCM framework focuses more on value-capture and value delivery, the ecosystem-based approach allows the disclosure of value-creating and even innovative activities. Both primary actors in the ecosystem supported the envisioning of innovative supply chain practices, e.g., delivery by winter road supply to remote trading posts on the migration routes of reindeer herders. Ecosystem services have been harnessed as part of an overall strategic adaptation for contextual change in this extremely remote Arctic region. This allowed local communities, including both Indigenous and local people, to buffer against the adverse effect of industrial development and climatic change and receive the benefits of civilization. In line with this, our findings have disclosed value as something unique to an ecosystem and the context in which it emerges and the member for whom it emerges. So, the process of value-creation in an ecosystem has been viewed to extend beyond the focal company's ordinary operational activities. These findings support and further extend some recent discussions about the role of coopetition in value-creating activities (Ritala et al., 2013; Meynhardt et al., 2016).

Thus, an ecosystem-based approach allowed us to study the adaptation to contextual modifications associated with the emergence of a new main industrial actor that expanded industrial facilities on the land originally owned by Indigenous reindeer herders. The findings also illustrate that boundaries are elusive and open-ended at the ecosystem layer, further making supply chain practices dynamic and interdependent. That is consistent with Aarikka-Stenroos and Ritala's (2017) study.

Final Remarks

This in-depth study argues that the management of supply chains in an "ecosystem era" faces significant changes, through the development of value-creating and innovative activities in balance with competition and value-capture. Our findings indicate that supply chain practice requires a willingness to mutually understand each other's boundaries and challenges toward integrated co-existence and take into account the needs of weaker, vulnerable actors in a single ecosystem. This is especially important when supply chain practice becomes fragile due to confrontation between the competing goals of the main actors' actions and intentions. It is bilateral efforts that lead to a synergistic interaction between all levels of the ecosystem, including interdependence on markets and local social communities with other dimensions of civic life.

Thus, the ecosystem approach requires the recognition of the actors' embeddedness and interdependence within supply chain practice, where value-creation as something unique extends beyond the actors' ordinary operational activities and day-to-day routines. Our study, which is thus in line with current calls for a greater focus on the societal public value (see Tsvetkova, 2021) and social needs and responsibilities (see Tsvetkova, 2020b), explores an emergent phenomenon of the supply ecosystem. This phenomenon results in new forms of integration among the actors and potentially unexpected social consequences owing to the complex interplay of the collective interdependencies of co-existence. Further, our empirical case illustrates business boundaries and underlying mechanisms of value-creation and capture within and across ecosystems. So, our findings have implications for managers who are continuously engaged in the development of supply chain operations in new contexts and have to deal with an "unknown animal called society" (Meynhardt et al., 2016, p. 2988).

Limitations and Further Research Opportunities

The study includes some limitations related to its qualitative nature and a focus on local-level operations, in which a limited number of actors were involved in consideration of the SCM practice. It would, therefore, be beneficial for further research to survey a larger sample of practitioners and cover more actors within and across a single supply ecosystem to extend this study's findings.

While we discussed the supply ecosystem in the Russian Arctic, the findings may not apply in completely different settings. However, we believe that our study provides interesting and profound implications for further research about value-creation and value-capture in various operational and supply chain practices and settings.

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