GERMAN - MONGOLIAN INSTITUTE FOR RESOURCES AND TECHNOLOGY

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Space for Entrepreneurship in the extractive sector of Mongolia – an entrepreneurial ecosystem perspective

Bachelor Thesis

by

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Statutory Declaration

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I did not use any sources other than those stated. In case that the work is additionally submitted on a data medium, I declare that the written and the electronic form are completely identical. The work was not submitted in the same or similar form to any examination authority.

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ABSTRACT

Mining suffers from limited employment prospects and a lack of adaptability, creativity, and business acumen. To address depleting resources, the extractive sector must embrace new technologies and approaches. This thesis examines innovative cases in Mongolia's mining industry and identifies key elements of an entrepreneurial ecosystem. Entrepreneurship involves seizing business opportunities, taking risks, and generating novel ideas, while innovation entails implementing and monetizing groundbreaking inventions to enhance value and productivity. Strong ecosystems comprising human capital, support networks, culture, finance, policy, and markets are vital for fostering entrepreneurship and economic growth. Mining entrepreneurs drive innovation through technological advancements, mineral discovery, and sustainable practices, while multinational mining companies stimulate innovation and entrepreneurship in economies. Emphasizing the contributions of leading mining companies is essential for gaining a competitive advantage in Mongolia's mining sector.

Due to their large-scale operations and investment structures, this case study examines two Mongolian mining sectors, Oyu Tolgoi (OT) and Monpolymet (MP). Analyzing OT and MP, which reflect foreign and domestic investment, is intriguing. In hour-long interviews, representatives from both firms were assessed on entrepreneurial traits like innovation, agility, risk-taking, creativity, empowerment, growth mentality, a result-oriented approach, and open communication. Based on the findings, Mongolian mining businesses do not properly understand entrepreneurship, but ecosystem enterprises do. MP builds its ecosystem, while OT integrates into one. OT has innovation, improvement, and risk management departments, while MP uses its core departments. MP makes decisions directly, while OT follows bureaucratic hierarchies. "Mongolization," simplifying or adapting processes to cultural norms, has pros and cons for Mongolians. Finally, the analysis yielded:

1. In the Monpolymet case, innovations are usually made through collaborations. Oyu Tolgoi innovates through Business Improvement and Transformation teams and idea-generating.
2. Operations, research, collaborations, and technological and human resources shape these actions and approaches. Innovation depends on leadership and decision-making.
3. Monpolymet and Oyu Tolgoi collaborate with local institutions, showing an indigenous entrepreneurial approach to incorporating local knowledge and expertise.
4. Both firms anticipate innovation throughout the mine life cycle.

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List of Abbreviation

IMF	International Monetary Fund
HBS	Harvard Business School
SME	Small and medium-sized
GoM	Government of Mongolia
ESG	Environmental, Social, and Governance
GHG	Greenhouse gas
CIM	Canadian Institute of Mining
EMC	The Erdenet Mining Corporation
OT	OyuTolgoi
TT	TavanTolgoi
RT	RioTinto
MP	Monpolymet
WHR	Waste Heat Recovery
AEIDC	Agricultural Economy and Innovation Development Center
BGR	Bundesanstalt für Geowissenschaften und Rohstoff
PMO	Process Management Operations
BI	Business Improvement
IO	Integrated Operations

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1. Introduction

1.1. Background

According to the International Monetary Fund (IMF), out of 216 countries, Mongolia is the 132nd largest economy globally, with a GDP of 15.72 billion US dollars (1). Mongolia is known for its nomadic lifestyle, which is highly reliant on the agriculture and animal husbandry industries. Nevertheless, after the declaration of democracy, the government of Mongolia has determined several deposits with rich natural resources in the Gobi area, located in the south of the country. It resulted in the extractive sector immediately becoming one of the sectors considered essential for developing the country's basic needs and being given priority over other sectors.

Currently, mining accounts for around 80% of exports and 25% of the country's GDP (2), dominating the Mongolian economy. However, mining provides a minimal share of the working force. While mining is vital for long-term development, there is a need for action in the extractive industry to increase living standards and sustain future growth. Also, the Mongolian economy became more dependent on the extractive sector. Therefore, the government has steadfastly reaffirmed its commitment to expanding and developing Mongolia's mineral deposits, emphasizing the importance of domestic processing over exportation (2). Its objectives center around amplifying the nation's tax revenues, retaining a more significant sum of monetary resources, and fostering a more diversified and robust future for economic growth (2).

An insufficient number of businesses and suboptimal processing capabilities hamper the mining sector. Furthermore, the industry's conventional and conservative nature, characterized by stringent regulations and entrenched players, constrains opportunities for development and innovation. Consequently, it contends that this sector requires an infusion of a more flexible, open-minded, entrepreneurial spirit and ecosystem.

1.2. Problem Statement

Mongolia is one of the most mineral-sector-dependent countries in the world. However, due to geographical and environmental constraints, Mongolia has needed more success in building other robust sectors and diversifying its economy. As a result, the mining industry has become inextricably linked to the country's economic growth and government revenues. Moreover, as natural resources diminish worldwide, natural resource-dependent countries might lose their competitiveness in circumstances that

lack efficient development of products and services. Therefore, in the context of increased global awareness regarding sustainability, climate change, and the pressing need for an energy transition from fossil fuels to renewable sources, the conservative extractive sector is faced with the challenge of adopting a new perspective and development approach that can foster an ecosystem of innovation and entrepreneurship. This transformation is essential for promoting innovation-oriented activities, enhancing competitiveness, and creating employment opportunities. In order to address this challenge, the extractive sector must embrace a mindset of change, explore novel technologies and business models, and collaborate with relevant stakeholders to create a sustainable future. Such a shift in approach will require a thorough reassessment of current practices, strategies, and policies and a commitment to investing in research and the development of innovative solutions that can effectively mitigate environmental impacts and promote sustainable development. Ultimately, the success of the extractive sector in this regard will depend on its ability to adapt to the evolving demands of the global economy and its capacity to leverage new technologies, promote entrepreneurship, and foster a culture of innovation.

1.3. Purpose and Research Questions

The primary purpose of this thesis is to look into cases of innovative approaches in the extractive sector of Mongolia and see if some conclusions can be drawn on the main characteristics or conditions under which an entrepreneurial ecosystem could thrive in the extractive sector of Mongolia. The following are the important questions to answer:

- What actions or approaches in existing mining projects can be characterized as innovative? And why?
- How did these actions and approaches evolve? What were the enabling factors (policies and strategies, technological and human resources, etc.)?
- Has any indigenous entrepreneurial mindset been applied in solving mining project problems?
- In which part of the mine life cycle innovation is most likely to occur?

1.4. Research Methodology

This work attempts to explore the current condition of Mongolia's innovation and entrepreneurship ecosystem within the context of the current mining companies' experiences through a qualitative method. This paper consists of two main parts. In the first part, the literature review provides theoretical background knowledge of the

innovation and entrepreneurial ecosystems. The second part describes the current innovation and entrepreneurial approaches in the mining sector. The data was collected from primary and secondary sources through relevant documents such as research articles, interviews, and documents. The collected data will be evaluated using the thematic analysis tool, which is a suitable method for this study as it allows for structured and visual analysis of the data. For this purpose, the data will be transcribed, coded, and categorized based on themes that emerge from the responses. The identified themes will be further analyzed to identify patterns and relationships between the responses, supported by relevant quotes and examples from the data. Finally, the analysis will be presented comprehensively and in detail, and the implications of the findings will be discussed.

2. Literature Review

2.1. Main Definitions of Entrepreneurship and Innovation

This section describes the origin of the term entrepreneurship. Furthermore, it introduces different approaches to integrating the concepts of entrepreneurship in the mining sector from the perspective of the entrepreneurial ecosystem.

2.1.1. History and Definition of Entrepreneurship and Innovation

The concept of entrepreneurship leads us back to the 1700s and Richard Cantillon. He first introduced the definition of entrepreneur from an economic perspective. According to Cantillon's terms, an entrepreneur is an individual who obtains goods at the current price to be sold at an uncertain future price (4). It implies that entrepreneurs face risks and uncertainties. From this definition, the overall concept of entrepreneurship originated. Then, in 1934, Schumpeter introduced the definition of an entrepreneur through his understanding of innovation. In such work, "the entrepreneur is the individual who innovates when he or she introduces something new in the market, either a product, a service, or a method, although recognizing that a substantial part of these innovations implies a combination of existing elements" (5). It means that entrepreneurs are alert to business opportunities, engage with business risks and future uncertainties, and create new ideas or methods.

Regarding entrepreneurship, HBS professor Howard Stevenson's statement established the contemporary and fundamental notion of entrepreneurship as follows:

"Entrepreneurship is the pursuit of opportunity beyond the resources you control" (6, 7, 8). In other words, it indicates that it is a process of seeking novel opportunities while lacking access to required resources like time, money, etc. Meanwhile, it is also defined as the capacity for innovation, investment, and expansion into new markets, products, and methods (9). According to these, conception of entrepreneurship is a set of certain essential things such as opportunities, risks, and limited resources. Furthermore, along with bearing the accompanying risks, entrepreneurship is the endeavor to create value by recognizing business opportunities and mobilizing the required resources to bring about a worthwhile project that results in independence and monetary and personal satisfaction. Assuming these definitions, entrepreneurship leads to investment to fulfill economic growth, which results in either creating new products and services or replacing existing ones (creative destruction or innovation of existing ones).

In the context of the applied sector, entrepreneurship refers to discovering and pursuing new business opportunities related to mining activities. That can involve creating new technologies, innovative approaches to mineral processing, exploring new mineral deposits, or developing new business models for mining operations. This sector requires substantial investment, technical knowledge, and expertise to navigate the legal and environmental frameworks surrounding mining activities, manage large-scale projects, and assess risks. Entrepreneurial activities can range from small-scale start-ups focusing on developing innovative technologies to large multinational corporations involved in complex mining projects worldwide. Entrepreneurship in mining aims to identify and pursue opportunities to create value by utilizing knowledge, expertise, and resources to promote sustainable and responsible mining practices. To succeed as an entrepreneur in the mining industry, one must possess the ability to recognize and seize opportunities that align with their fundamental skills, principles, and objectives. Moreover, they must skillfully manage relationships with stakeholders, including local communities, governments, and investors. Doing so ensures that their mining operations are ethical, sustainable, and socially responsible and will continue to be so for an extended period.

As for innovation, various academics have expressed their understanding of it. Most of them are like, "It generates value, and it refers to something new and doing something in a new way." The easiest way to define innovation is as follows:

Innovation= invention x commercialization (10)

Distinguishing between invention and innovation is crucial. It implies that the starting point of innovation is an invention. Innovation adds value beyond mere invention. Innovation enhances efficiency and user satisfaction. Conversely, an invention lacks value until it is commercialized. Commercialization promotes innovation. Commercialization involves introducing a new concept or technology to the market, providing access to consumers, and enhancing its worth (11, 12). Commercializing innovation is challenging. Good commercialization is essential for innovative inventions to succeed. Innovation generates value by merging novel concepts or technologies with successful commercialization. It means that it concerns the practical application of inventions. Therefore, the innovation equation is a product of invention and commercialization. In brief, it aims to come up with new ideas and technologies to increase productivity and generate greater output or value. It is also an essential aspect of entrepreneurship. Because it is an entrepreneur's particular instrument, the way by which they exploit change as an opportunity for a different business or service (13).

Entrepreneurs often strive to create something new or improve upon existing products or services. Innovation is the tool that allows them to do so by generating new ideas, technologies, or processes. Innovation also gives entrepreneurs a competitive advantage by differentiating them from competitors and attracting customers seeking unique offerings. It can even open up new markets by catering to previously neglected customer segments.

Thus, innovation plays a vital role in entrepreneurship, empowering entrepreneurs to pursue opportunities beyond their current resources, create value, and achieve their goals. In addition, innovation enables entrepreneurs to navigate ambiguity and change while adapting to market conditions and customer needs. Ultimately, innovation can be the key to entrepreneurial success by enabling the creation of sustainable, profitable businesses that add value to customers and stakeholders.

2.1.2. Intrapreneurship in medium and large-scale companies

In order to understand the concept of entrepreneurship deeper, an understanding of intrapreneurship is needed because it could be called a previous stage of entrepreneurship or inner entrepreneurship. The term intrapreneurship was first stated by Pinchot (18), with the definition saying intrapreneurship entails seizing a new

opportunity and creating economic value within the organization. After this definition, Drucker (19) stated that intrapreneurship is associated with creating new opportunities for business blooming and extension.

Intrapreneurship involves employees within organizations taking the initiative to launch new business ventures. While it shares similarities with corporate entrepreneurship, there are distinct differences. Corporate entrepreneurship focuses on top-down processes orchestrated by management to encourage innovation, while intrapreneurship emphasizes bottom-up initiatives taken by individual employees. It means that intrapreneurs foster either autonomy or independence. Despite facing limitations from the corporate hierarchy, intrapreneurs also benefit from the support and resources their organization provides.

Intrapreneurs are proactive, taking the initiative to transform ideas into profitable ventures within their organization (20). They exhibit innovative behavior to improve organizational performance through autonomous strategic actions (21). Striking a balance between managerial and entrepreneurial talents is crucial for intrapreneurs to drive innovation, growth, and competitive advantage within their organization (18). Intrapreneurs catalyze creativity, transforming dreams and ideas into lucrative ventures. They are recognized as risk-takers and innovators. Nevertheless, as for the risk, it is low and controllable. As mentioned earlier, intrapreneurs work with limited resources, structure, and financing within the organization.

A solid internal climate within the organization can support intrapreneurship by fostering an environment conducive to creativity and innovation. This climate can act as a catalyst for intrapreneurial activities, enabling businesses to thrive. Innovation and intrapreneurship work hand-in-hand, keeping organizations agile and fostering growth. Temporary monopolies established through innovation can significantly impact a company's survival and growth. Numerous studies have confirmed the positive effects of innovation on wealth creation, productivity, profitability, and overall growth. In the case of the difference between SMEs and large firms, according to the comparative research of Camille Carrier, these results were published (22).

Table 1. Entrepreneurship in large firms and SMEs

Factor	Large firm	SME
Structural context	- More rigid structure - Logic of intrapreneur detection - Convergence appreciated but not essential	- Flexible structure - Logic of matching or convergence - Convergence essential
Relationship related context	- Coupling intrapreneur-manager may be difficult - Anonymity possible	- Coupling intrapreneur-entrepreneur is more natural - Anonymity more difficult
Rewards	- Promotion not appreciated by intrapreneurs - Difficult to determine - Difficult to estimate	- Promotion valued by intrapreneurs - Easy to personalize - Easier to estimate
Strategic processes	- Generally deliberate and formal - Strategically precedes intrapreneurs	- Incremental and heuristic - Intrapreneur precedes strategy
Intrapreneur's dissatisfaction	- Consequences usually not threatening	- Important danger of competition increased

Source: Carrier, 1994.

According to Table 1, the following results were obtained, and they classified five main factors that will be explained further:

Structural Context

Identifying potential intrapreneurs in large organizations is a significant challenge due to rigid structures and impersonal systems. Various authors have explored strategies to better detect intrapreneurs in such settings. Conversely, in small and medium enterprises (SMEs), intrapreneurs are more easily recognized, and their success relies on aligning with the owner-manager's vision (22). The main factor influencing intrapreneurship in SMEs is the owner-manager's willingness to collaborate with others and share the company's stage.

Relationship-related Context

A significant difference between large organizations and SMEs is the relationship between intrapreneurs and their supervisors. In larger firms, conflicting goals between intrapreneurs and managers may hinder innovation, while in SMEs, intrapreneurs have

better access to top management and face fewer relationship-related obstacles. However, intrapreneurs in SMEs often work more openly, making them more susceptible to criticism (22).

Enhancement and Rewards

Both large and small companies should reward intrapreneurs for their risks and achievements. Promotion is commonly rewarded in large firms, but it may differ from the intrapreneur's desire for autonomy. In SMEs, promotion is often appreciated as it expands their reach and increases their freedom. SMEs also offer a more intimate environment to negotiate rewards (22).

The Strategic Processes Involved

For large companies to foster intrapreneurship, they must create detailed strategies and inform their staff. In small business settings, intrapreneurs drive intrapreneurship and guide the company to benefit from their energy. In most cases, owner-managers develop intrapreneurial tactics after acknowledging an intrapreneur nearby. These strategies evolve gradually through mutual agreement and adjustments among team members (22). The intrapreneur's presence and personality initiate the strategic process. The strategy focuses on supporting intrapreneurship within the company, reacting to an intrapreneur's emergence rather than anticipating it. This approach shows greater adaptability than strict planning.

Consequences of Dissatisfaction Among Intrapreneurs

Maintaining intrapreneurs' motivation is crucial for both large and small companies. Unhappy intrapreneurs often leave restrictive organizations to start their businesses, taking skilled employees with them. This situation significantly impacts small and medium-sized enterprises (SMEs) due to their limited financial resources (22). Intrapreneurs may become competitors or join rival firms, sharing valuable information.

To sum up, intrapreneurship is vital for SMEs and larger companies but requires different approaches. SMEs have friendlier, more flexible structures, allowing for easier detection and collaboration. Intrapreneur rewards can be negotiated more personally in SMEs. Processes in SMEs are often more incremental and adaptive. SME owners should consider the risks of losing intrapreneurs and understand that strategies built for larger companies may not fit their needs.

2.1.3. Entrepreneurship and innovation ecosystems

Currently, numerous academics have developed various models of entrepreneurial ecosystems. The distinguished model, however, created by Professor Daniel Isenberg at Babson College, is fascinating and has more varied components (23). Isenberg proposes six critical dimensions within the ecosystem, which are also widely used globally: a conducive culture, enabling policies and leadership, the availability of sufficient finance, qualified human capital, venture-friendly marketplaces for products, and a diversity of institutional supports (24). These six areas are subdivided into hundreds of minor pieces that interact in highly unique and quirky ways across the spectrum of entrepreneurial activities.

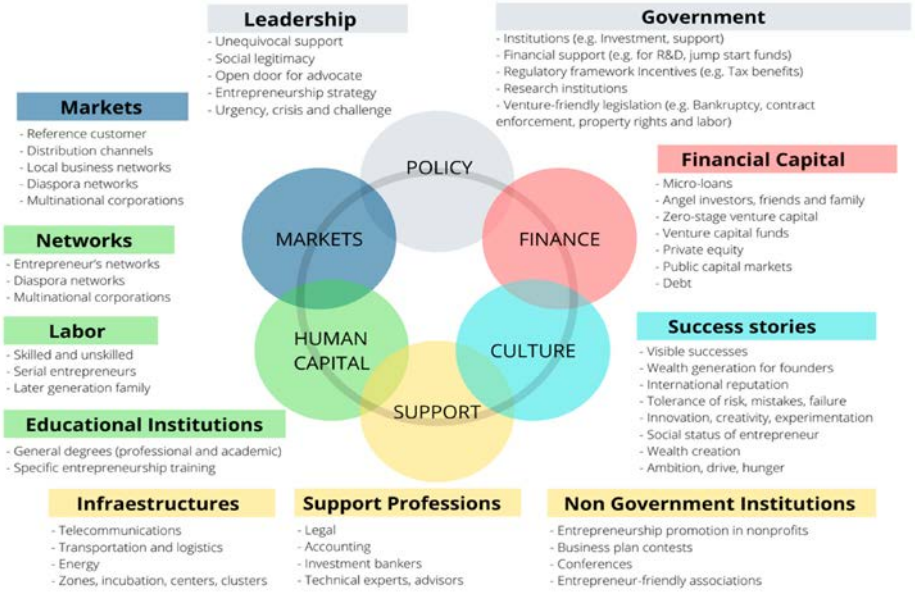

Figure 1. Entrepreneurship ecosystem Source: Isenberg, 2013

An entrepreneurial ecosystem is a dynamic network of interdependent factors that contribute to the creation and growth of new businesses. To effectively support and foster entrepreneurship, several critical components are necessary:

1. Human capital: Successful entrepreneurial ecosystems require a pool of talented and skilled individuals with diverse backgrounds and experiences. That includes entrepreneurs, investors, mentors, advisors, and other professionals who can provide guidance and support.

2. Support: Access to supportive networks and resources is essential for the success of new businesses. Incubators, accelerators, mentorship programs, co-working spaces,

and other resources can give entrepreneurs the tools, knowledge, and connections they need to succeed.

3. Culture: A supportive culture that fosters innovation and risk-taking is essential to the success of an entrepreneurial ecosystem. That includes a willingness to experiment, a tolerance for failure, and a community that celebrates and rewards entrepreneurship.

4. Finance: Access to finance is critical for entrepreneurs, as they need capital to start and grow their businesses. An entrepreneurial ecosystem must have a range of funding sources, including angel investors, venture capital firms, crowdfunding platforms, and other funding sources such as grants and loans.

5. Policy: Government policies and regulations can play a significant role in supporting entrepreneurship. Policies encouraging entrepreneurship, such as tax incentives, streamlined business regulations, and intellectual property protections, can help create a supportive environment for new businesses.

6. Markets: Access to markets is crucial for the success of new businesses. An entrepreneurial ecosystem must have access to local and global markets and networks and partnerships that can help entrepreneurs reach these markets.

To build a thriving entrepreneurial ecosystem, a holistic approach that recognizes the interdependence of these factors is necessary. A supportive culture, diverse human capital, access to finance and markets, and policies that promote entrepreneurship are essential to creating an environment that fosters innovation and new business creation.

On the other hand, as for the **innovation ecosystem**, professors at the MIT Sloan School of Management researched and extracted the world's most epic innovation ecosystem. The study showed that five critical stakeholders lead to the successful creation, continuous growth, and acceleration of the innovation-driven entrepreneurship ecosystem (25).

Figure 2. Innovation ecosystem stakeholder model Source: MIT, 2019.

As Figure 2 shows, the five stakeholders in the innovation-driven entrepreneurship ecosystem are as follows (25):

1. Entrepreneur
2. University
3. Government
4. Corporate
5. Risk capital

The authors (25) also assess the available literature from several viewpoints on which actor is critical to boosting economic growth or creating an innovation environment in the community. Most successful ecosystems in the industrial economy are based on the concept of cooperation between "industry" and "government," which has resulted in an industry-government collaboration that mainly focuses on military advances and R&D. With the expansion of the information economy in the late twentieth century, a third stakeholder became involved: higher education institutions. That resulted in the "Triple Helix" concept, representing "industry-government-academia" collaboration. The MIT professors proposed innovation ecosystem model goes beyond the "triple helix," reflecting the circumstances of the twenty-first century. The triple helix model refers to interactions between academia, industry, and government to foster economic and social development, as described in concepts such as the knowledge economy and knowledge society.

Scholars dispute which actor has the most influence on the innovation ecosystem to summarize the global literature. Every stakeholder in any ecosystem hopes to expand

their capacities and transform information into innovation in partnership with other stakeholders. In this scenario, it is critical to investigate the relationships between those actors. Each country's effective innovation ecosystem has evolved uniquely; nonetheless, scholars have agreed on certain fundamental qualities. First, the high quality of higher education institutes has a considerable influence. Second, the state must provide adequate regulatory support (money and regulatory help). Finally, industrial commercialization is critical.

2.2. Entrepreneurship and Mining: the global experience

The mining industry is among the most critical earning sources for numerous nations. In the last few decades, this industry has been expanding considerably. Since its growth, the number of large and multinational companies has been increasing. To differentiate, companies constantly strive to gain a competitive advantage through new development, innovation, and entrepreneurship. The following list shows the world's top three most prominent mining companies by market capitalization and earnings. These are all multinational companies that lead the mining industry through entrepreneurial and innovative actions.

1. **BHP Group**

BHP Group is the world's top mining company, with around 80,000 employees at 90 locations worldwide, with headquarters in Australia (26). BHP leads the mining industry through comprehensive strategy and policy to provide sustainability for the company. Thus, BHP focuses mainly on innovation and community. However, challenges and risks are specific to every kind of business. So, the entrepreneurial and intrapreneurial qualities of the company are crucial and determine whether the business will survive or succumb. Therefore, BHP applied Porter's model, which is a very effective model for examining a sector's competitive environment and includes the main five forces such as the threat of new entry, the intensity of competitive rivalry among existing firms, the threat of substitute products or services, and the bargaining power of suppliers and the bargaining power of customers (27). According to this model, BHP works as follows:

- *The threat of new entrance*

Current operating businesses and regulatory authorities set barriers to prevent new entrants from producing anomalous profit flows for current companies. Examples of risks include government laws, leveraging cost advantages, access to distribution, and capital needs. In this scenario, the mining industry is particularly capital-intensive due to the high cost of acquiring mines and mining equipment. This makes BHP Billiton's initiative

worthwhile since the higher the capital structure of a sector, the more difficult it is for new entrants, so established corporations like BHP can receive returns on their investments (27).

- *The intensity of competitive rivalry among existing firms*

Firms in the identical sector constantly compete for the available market (28), which can be accomplished through effective competitive strategies, innovation, cost structure, switching costs, the level of product or service distinction, etc. For example, BHP Billiton is known to employ scanning for mines in faraway locations such as the Democratic Republic of the Congo, South Africa, Brazil, Indonesia, and Canada (27).

- *The threat of substitute products or services*

Consumers may choose substitute products if the quality is high, the price is low, or the switching cost is low. However, there are few replacements for the minerals and products offered by BHP Billiton, for example. Iron is iron, and there is no substitute; the same is true for silver and minerals like oil. As a result, the mining industry, BHP Billiton's core business, is highly entrepreneurial and successful because some of the minerals they harvest have no near-equivalents (27).

- *The bargaining power of customers*

The bargaining power of buyers is contingent upon several factors, including the number of customers within the industry who purchase from a diverse range of suppliers, the degree of product differentiation, the profitability of buyers, mainly if they are resellers, the expenses associated with switching brands, and the significance of quality and service to buyers. BHP Billiton can strengthen its bargaining power and diminish that of consumers by delivering high-quality and highly differentiated products and having a large number of customers seek its products compared to its competitors (27).

- *The bargaining power of suppliers*

Suppliers of raw materials can determine an industry's profitability and viability by setting pricing for tools, which affect profit margins. According to this, BHP is a resource supplier to the nation. Thus, it has advantages in setting prices and standards and maintaining its bargaining power (27).

BHP is an innovative, entrepreneurial, large-scale firm that searches the world for economic mining prospects. It takes risks, forges collaborations with other companies, and frequently sells critical company divisions to move on to regions with more business potential. BHP confronts many challenges in its operations and must adapt to changing consumer wants by dispatching personnel to obtain relevant research data. Its

organizational structure employs CSGs, which means that its job groups are organized by grouping the leadership and staff according to the various customer groups, resulting in a flat structure with fewer managers, faster communication, strong employee team spirit, less bureaucracy, and easier decision-making (27).

BHP, a global mining and metals company, has achieved several entrepreneurial successes. Here are some notable examples:

1. Diversification: BHP has diversified its operations into multiple commodities, which has helped the company generate stable cash flows. The company has a strong position in the iron ore, copper, coal, oil and gas, nickel, and potash markets. In 2021, BHP reported record iron ore production, contributing to its strong financial performance (29).

2. Innovation: BHP has invested heavily in innovation, which has improved its efficiency and reduced costs. The company has introduced autonomous trucks and drilling equipment, which has increased safety and productivity at its mining sites (29).

3. Sustainability: BHP has set ambitious targets to reduce greenhouse gas emissions and improve its sustainability performance. The company has pledged to achieve net-zero emissions by 2050 and has invested in renewable energy projects, such as wind and solar power (30).

4. Strong Financial Performance: BHP has consistently delivered strong financial results, focusing on cost efficiency and disciplined capital allocation. In 2021, the company reported a net profit of US$17.1 billion, up 42% from the previous year (29).

5. Strategic Acquisitions: BHP has made strategic acquisitions to expand its portfolio and increase its market share. In 2018, the company acquired the shale assets of Petrohawk Energy Corporation for US$10.8 billion, which helped it establish a significant presence in the US shale industry (29).

In order to gain competitive advantages and create social value, BHP always seeks opportunities to collaborate with innovative partners, start-ups, and communities. Therefore, BHP focuses on developed technologies, innovative ideas, projects, and mutually beneficial collaborations and works directly with the community.

2. RIO TINTO

Rio Tinto is a major player in the mining industry and works in 35 countries with 49,000 employees worldwide (26). So it has broad experience. In 2021, Rio Tinto launched a new integrated strategy with the main focus of "decarbonization," which directly addresses climate change and sustainability (31). The strategy includes a set of new commitments across three pillars of activity, with four objectives to guide how we want to develop our business. The three key pillars are to accelerate the decarbonization of assets, develop products and technologies that help customers decarbonize, and grow in materials enabling the energy transition. Achieving this strategy depends on four criteria: becoming the best operator, achieving perfect environmental, social, and governance (ESG) credentials, excelling in development, and protecting the social license. These critical components will aid businesses in becoming recognized worldwide partners by increasing productivity and lowering capital intensity. As a result, the policy of strategy and values provides innovation, and according to the strategy, innovative ideas and solutions are essential for its implementation. For example, excelling in development implies broadening the approach to developing the pipeline of growth options and testing innovative ways of bringing projects to market faster. Its commitment to capital discipline will be maintained through it all, and opportunities that create value will be pursued.

Innovation has always been important to Rio Tinto and is crucial in enabling us to manage change for future success. Empowering employees to innovate is especially important as it tackles climate change and supports customers in their decarbonization journey. For that reason, Rio Tinto provides the Pioneer Pitch program (32). It is a global, all-inclusive program designed to capture employees' creative ideas and accelerate innovative solutions by offering seed funds to develop such ideas further. The primary purpose of that pioneering program is to find innovative and creative ways to solve its current business challenges. Thus, the current challenges are posted at the pioneering portal so that innovators can submit their ideas. It helps to find the solution and gain more ideas in a short period of time. In 2021, Rio Tinto held the sixth Pioneering Pitch session and funded eight projects for further development. Forty-seven projects have been funded, and over $8 million has been invested in its employees' ideas and projects (33).

Rio Tinto is always open to new ideas on sharing the benefits of mining projects in a way that maintains and grows investor returns, produces long-term value for host

governments and communities, and supplies the metals the world requires in an ecologically friendly manner. Partnerships and cooperation are critical to long-term development; they provide a competitive advantage and allow organizations to operate more intelligently and ethically. At all phases of the mining lifecycle, from exploration to rehabilitation and closure, Rio Tinto collaborates with technological experts, universities, suppliers, governments, community groups, industry leaders, and civil society organizations. For instance, Apple and the governments of Canada and Quebec supported Rio Tinto's declaration of an alliance with Alcoa in 2018. This collaboration will advance a new method that reduces direct GHG emissions from aluminum smelting with pure oxygen. That technology will be developed and authorized for use in current and new smelters in 2024 (34). Working with AustMine, Rio Tinto has also launched the Innovation Challenge in response to climate change and aims to identify novel technologies to electrify mining vehicle fleets to reduce diesel use and emissions across the industry (32). Also in 2023, Rio Tinto partnered with the Canadian Institute of Mining (CIM) to advance Canada's mining innovation and improve the technical capabilities of Rio Tinto through the three-year alliance. It means that Rio will benefit from CIM's leadership in industry development, and CIM will have access to the miner's expertise and resources (35).

Continuously engaging with stakeholders and listening to their diverse points of view enables us to make a more meaningful contribution to society while becoming a more valuable company for our shareholders. Hence, products and technologies are developed quickly, generating more value.

3. GLENCORE

GLENCORE is a multinational commodity trading, metals, and mining company. The company has almost 135,000 employees (26). Glencore supports entrepreneurship, especially intrapreneurship. Therefore, their culture of entrepreneurialism says," Our people think and act like entrepreneurs." Glencore built a culture that rewards dedicated people with a can-do spirit, who take responsibility, and who have the drive to be leaders in their field. Operating in more than 35 countries with a diversified business structure, Glencore offers high levels of responsibility to the right people (36). While supporting the "intrapreneur" employees, they also support other external entrepreneurs, innovative ideas, and projects to build a better community and create more social value. Therefore, Glencore creates an environment where employees can be open to each other and respected for their unique contributions and talents. In terms of innovativeness, they also

focus on developing new technology. Thus, Glencore works on these advanced new technologies that bring innovation through its subsidiary, "Glencore Technology."

Glencore Technology's innovation must start with collaboration. Collaboration and partnership assist it by helping to find novel ways of identifying and developing technologies, improving processes, and maintaining existing applications in the mining industry. In this time frame, for example, Glencore announced a global strategic partnership with Li-Cycle in 2023 (37). This partnership will last for the long term and is mutually beneficial. Also, Glencore Technology and Netsch GmbH partnered in the development of IsaMill Technology (38). As for entrepreneurship, Glencore supports its community by providing many projects, investing in enterprises, and supporting young entrepreneurs and their innovative ideas and projects to create new ideas and jobs, generate value, and gain a competitive advantage. For instance, Glencore organizes enterprise development programs that give entrepreneurs the skills and mentorship they need to sustain their businesses (39). It also launched its Enterprise Supplier Development program. This business hub seeks to empower and assist local SMMEs in its host communities while also creating equal opportunities for businesses to operate sustainably, ultimately improving the livelihoods of the communities and their members. For example, Glencore Ferroalloys recently provided over R1 million in machinery to local businessman Stanley Masege of the Mmatsie Projects and Supplies Company (40).

Ultimately, based on these big mining companies' experiences, the leading entrepreneurial companies focus on technology-based innovations, collaborations, and partnerships. Idea creation is crucial for the entrepreneurial environment. Hence, to generate new ideas, most companies cooperate with research institutions and other innovative companies on projects, invest in start-ups, support external and internal entrepreneurs, and provide them with resources, mentorship, and training programs. These activities are efficient for creating value, such as job creation, development opportunities, setting standards, economic expansion, etc. Therefore, in the next chapter, the current state of entrepreneurship and innovation in the Mongolian mining sector and the cases of large companies in Mongolia will be analyzed.

3. Entrepreneurship and Mining: Mongolian case

3.1. Extractive Sector Development in Mongolia

As for the developing country, its main economic driving force is the extractive sector. The history of Mongolian mining brings us back to the BCE. However, on December 25, 1922, the "Nalaikh Coal Mine" became the state's property, which became the basis for the formation of the mining industry in Mongolia (41). In the following years, the government of Mongolia (GoM) focused on developing the extractive sector, and foreign experts came to explore and research geology. As a result, in 1925, the research team of the Soviet Union explored the ores of iron, coal, lead, and zinc (42). Some major mines were founded in the following decades, such as the 1960s and 1990s. One of these significant mines is "The Erdenet Mining Corporation" (EMC), which is considered the leading development of the century in Mongolia (43). It is a copper and molybdenum mining and concentrating company. Generally, Mongolian extractive sector development has three main stages:

- 1922-1978: The period when the mining industry began to develop
- 1978-1994: The period of development of the mining and beneficiation industry
- After 1994: Along with extraction and enrichment, processing plants were created (42)

So, after the democratic revolution, the GoM implemented some policies and programs to encourage foreign investment in the minerals sector (44), leading to the discovery of 16 deposits of strategic importance, four of which are being developed (45). It includes EMC, Oyu Tolgoi (OT), Tavan Tolgoi (TT), etc. As a result, Mongolia is one of the top ten resource-rich countries in the world. According to current research, it possesses more than 80 types of minerals, attracting international attention in the global resource market (46). Among those minerals, coal, copper, molybdenum, gold, fluorite, and oil are the main strategic minerals. In addition, it has also been confirmed to have essential mineral resources such as tungsten, zinc, and uranium. The total reserves and resources of mineral deposits and their global rankings are shown in the following table.

Table 2. Estimated mineral reserves and resources and their global rankings

Mineral	**Reserves and Resources***	**Unit**	**Global Rank**	**Share of Global Total (%)**
Tungsten	295,204	Ton	6	2.6

Coal	22,926,287,000	Ton	11	2.5
Uranium	284,338,832	Pound	12	1.1
Molybdenum	922,050	Ton	12	1.6
Copper	60,089,235	Ton	14	2.1
Gold	73,881,200	Ounce	21	1.1
Zinc	2,638,294	Ton	30	0.4
Iron ore	1,128,065,000	Ton	33	0.1

Source: Asian Development Bank, 2020

Regarding mineral resources, tungsten ranks 6th, copper ranks 14th, coal ranks 11th, molybdenum ranks 12th, and uranium ranks 12th (46). In addition, it is believed that there are many undiscovered mineral resources.

In 2008, the price of minerals dropped significantly, which slowed economic growth. However, in late 2009, the price of commodities increased, and the economy stabilized. The massive development of mineral resources brought rapid growth in GDP from 2009 through 2013, from USD 1700 to USD 4300 per capita (47). Since then, the mining sector has been developing steadily.

Today, the mining sector accounts for around 80% of exports and 25% of the country's GDP, dominating the Mongolian economy (48). As of the first 11 months of 2022, coal (30,560.3 thousand tons), copper concentrate (1,091.2 thousand tons), gold (18,078.0 kg), molybdenum concentrate (5,401.8 tons), iron ore (7,500.8 thousand tons), and so forth were produced, respectively. From the same period last year, coal increased by 10.5%, gold by 0.8%, and zinc concentrate by 2.4 times. However, copper concentrate increased by 10.8%, molybdenum concentrate by 7.5%, iron ore by 13.0%, and others decreased, respectively (49).

In terms of money, in the first 11 months of 2022, 3,671.0 billion MNT has been collected in the form of taxes and fees in the state budget. Of this:

Table 3. One-time contribution to the state budget, first 11 months of 2022

Mineral	**Into the state budget (MNT)**
Copper	1,585.7 billion

Coal	1,530.6 billion
Gold	237.5 billion
Zinc	161.0 billion
Iron	35.7 billion
Flourite	23.9 billion
Other minerals	96.6 billion

Source: Ministry of Mining and Heavy Industry, 2022

The revenue collected in the state budget from the mining and extraction sectors decreased by 36.9 billion MNT, or 1.0 percent, from last year (49).

From the previous information, the mining sector is definitely the driving force of the Mongolian economy, and the sector's size is expanding rapidly. The more mining companies there are, the more competition will happen. Hence, to gain a competitive advantage within the mining industry, companies always need to strive to differentiate themselves. For further information, the contribution of the Mongolian top mining companies to extractive sector development in terms of innovation will be introduced.

1. **Oyu Tolgoi**

Oyu Tolgoi is a mining project located in the South Gobi region of Mongolia. A joint venture between Turquoise Hill Resources and the Mongolian government manages one of the largest known copper and gold deposits in the world. It is located in Khanbogd, Umnugobi, and in terms of ownership**,** the GoM and Turquoise Hill Resources own 34% and 66%, respectively (50).

The Oyu Tolgoi mine was first discovered in 2001, and construction began in 2010. The mine is approximately 80 km north of the Chinese-Mongolian border and 550 km south of Mongolia's capital, Ulaanbaatar.

Estimated deposit**s** of OT are the following:

- Gold - 1.7 million ounces
- Copper - 2.7 million tonnes
- Silver - 1900 tonnes
- Molybdenum - 205000 tonnes (52)

The mining process at Oyu Tolgoi involves open-pit mining, with the extracted ore processed on-site using a concentrator plant. The mine produces copper concentrate,

which is then shipped to smelters worldwide, as well as gold concentrate. Oyu Tolgoi is an essential contributor to the Mongolian economy and employs over 12,300 people, with most of the workforce (96%) being Mongolian (53). The mine also supports local businesses through its procurement and supply chain activities. By the third season of 2022, OT paid USD 237 million or MNT 716.8 billion in taxes, fees, and other payments to the GoM and partnered with 788 suppliers, including 525 national businesses, accounting for 75% of the total operations procurement spend (54)

In addition, the mine has been criticized for its environmental impact. Some activists and groups have raised concerns about the impact of the mine on the local water supply and ecosystem. However, the Oyu Tolgoi project has implemented measures to minimize its environmental impact and has been working with local communities to address concerns. OT always pays attention to innovation and collaboration. Therefore, the company's efforts directed toward innovation and cooperation include:

- Participatory environmental monitoring - 118 herders /first half of 2021/ (55)

In order to maintain and improve their cooperation with the community, OT organizes several programs. One of these programs is participatory environmental monitoring. Through this monitoring, OT and local herders monitor the condition of water resources and precipitation, soil degradation and soil moisture, pasture and beneficial plants, wildlife and natural open water bodies, air quality and ambient dust, comprehensive monitoring of sites potentially impacted by mining operations, and ecological education for young people and students. The primary purpose of this monitoring is to be near the local community, step into sustainable development, and so forth.

- Meetings and training programs with local citizens

Also, OT usually organizes meetings and training programs with local citizens to support their knowledge, skills, and development of the local area. Also, in terms of collaboration, OT has contracted with the local SMEs to complete their supplies, such as workwear and protective equipment (56).

- The "Global Nomads" program - aims to give employees additional experience overseas.

In order to support its employees' individual development, the company constantly seeks and provides opportunities to study and improve their professional skills abroad. As a result, OT has very skilled human resources, so their mindset becomes innovative and open-minded (56).

- Underground mining - block caving method

It is the most significant innovative work of OT and is considered an immense contribution to Mongolian extractive sector development. Most of the valuable minerals are deep underground, and OT constructed a world-class underground mine to access the ore mass. It has a cutting-edge control room supervising the activity, including roughly 200 kilometers of tunnels with five shafts. In order to extract the ore mass, the leading technique, the block caving method, will be used. That method is physically challenging but is also one of the best and most cost-effective ways of extracting ore from deep beneath the earth because it relies on gravity (56).

- The Gobi Oyu support fund

The Gobi Oyu Development Support Fund, established in 2015, is another OT success story. It has provided MNT 65.3 billion (USD 27 million) in funding and supported more than 187 projects and programs for healthcare, transport, education, food processing, agriculture, and heating—all locally supplied and employed (56).

- Safety first

In order to keep their employees safe and build a safe environment, OT adopted modern standards and used technological innovations, such as the SmartCap device to check and control the fatigues; partnered with the Ministry of Mining and the Mongolian Unmanned Aerial Vehicle Association to use drones for blasting, removing people from blast zones and contributing to a safer and more efficient mine; and also applied some innovative and safer techniques like re-split blasting and block-caving methods that are cost-efficient (56).

In conclusion, Oyu Tolgoi is a significant mining project in Mongolia with large reserves of copper and gold. Despite some challenges and controversies, the mine is essential to the Mongolian economy and employs thousands of people. Furthermore, the Oyu Tolgoi project continues to work to minimize its environmental impact and support local communities.

2. Erdenet Mining Corporation

Erdenet Mining Corporation (EMC) is a mining company based in Mongolia that specializes in extracting and processing copper and molybdenum ores. It was established in 1978 as a joint venture between the governments of Mongolia and the former Soviet Union. EMC has since become a vital contributor to the country's economy

and a critical player in the global mining industry. GoM (51%) and Mongolian Copper Corporation (49%) now own it (57).

EMC operates an open-pit mine in the Orkhon province of Mongolia. The mine produces copper and molybdenum ores, which are processed at EMC's concentrator plant. The plant can produce over 530,000 metric tons of copper concentrate and 4,500 metric tons of molybdenum concentrate annually (57). The company exports its products to customers in Asia, Europe, and North America. Over the years, EMC has invested heavily in modernizing and expanding its operations. In 2017, the company completed a significant expansion of its concentrator plant, increasing its production capacity and efficiency (58).

Additionally, EMC has strongly emphasized environmental protection and social responsibility. It has implemented reforestation programs and community development initiatives in the areas surrounding its operations (59). In 2019, the government appropriated the company and made it 100 percent state-owned, increasing its sales revenue and contribution to the state budget (58). EMC significantly contributes to the Mongolian economy, accounting for a significant portion of the country's exports and government revenue. The company employs over 8,000 individuals (60), including Mongolian and foreign workers. Its procurement and supply chain activities have supported local businesses and industries.

However, EMC has encountered challenges recently due to copper prices and operational issues. The company has implemented cost-cutting measures to address these challenges and is exploring new business opportunities and partnerships to diversify its revenue streams. EMC plans to improve its operational capacity by introducing innovative technology with low operational costs and high productivity, increasing its competitiveness, and manufacturing value-added products. They plan to continue exploration and upgrade resource classification, potentially increasing operational reserves for future development (58). In addition, the corporation will invest in bringing its semi-grinding shop into operation and upgrading the flotation equipment in stages, creating the opportunity to reduce ore processing costs and increase sales revenue. EMC has aided the country's economic and social development via entrepreneurial and creative efforts. Here are a few noteworthy examples:

- Economic Impact: EMC is one of Asia's significant copper and molybdenum mining and processing firms. The enterprise has brought considerable cash for the Mongolian government and employed thousands of people. EMC provided MNT 442.7 billion (US$156 million) to the Mongolian state budget in 2020 (61).
- Innovation: EMC has invested in technology and innovation to enhance its operations and lower its environmental imprint. The business has developed a new technique known as the "Hydrocyclone" method, which increases the efficiency of copper and molybdenum recovery (61). The company has also implemented a continuous improvement program to identify and address operational inefficiencies. In recent years, it is focused on more innovative activities, for example:
    - Construction of an oxidized ore processing plant using leaching technology SX / EW
    - Copper concentrate processing and metallurgical-chemical industry project
    - Establishment of the industrial and technological park "Complex of Mining, Metallurgical and Chemical industry" based on "Erdenet Mining Corporation" SOE, etc. (62)
- EMC is dedicated to environmental responsibility and has adopted several steps to lessen its environmental effect. The corporation has invested in wastewater treatment facilities and implemented a zero-waste strategy, intending to recycle or reuse all waste created by its activities (61).
- EMC has made a social contribution to Mongolian development through its community investment programs. In the Erdenet City and Orkhon province where it works, the corporation has established schools, hospitals, and other social infrastructure (61).
- Erdenet has been researching the extraction of oxidized and low-grade ore from its processing facility using innovative technologies with little environmental effect for many years. This study has resulted in the formation of several new businesses. Erdman Company produces 2500-2800 tons of cathode copper per year (25 percent owned by Erdenet Mining Corporation), Sibcable Energy produces about 300 tons of copper wires with Erdenet content, and Achit Ikht Company produces over 10,000 tons of cathode copper low-grade ore per year. For many years, Erd Sulj (with 100% investment from Erdenet Mining Corporation) has been its personnel's exclusive work clothing provider (61).

Through these efforts, the company tends to expand its operations and products, which will help it achieve economic benefits. Also, by building the industrial and technological park, EMC can gather new ideas and opportunities to develop innovative products, technologies, and operating methods. It means that the company is aiming to nurture innovation more.

Overall, EMC's entrepreneurial approaches have enabled the company to become a leading player in the mining industry, contributing significantly to Mongolia's economic growth and development. In addition, the company's commitment to corporate social responsibility, investment in research and development, and innovation and creativity have helped it remain competitive in a constantly evolving market.

3. Monpolymet

If "Monpolymet" is not included in Mongolia's mining history, several pages seem to be torn. The company, founded in 1992, can be called extractive-restorative, and its business cards are rehabilitation, eco-production, and sustainable production. During its almost 30 years of working in the mining industry, Monpolymet LLC (MP) became an example of responsible mining and spent more than 10 million US dollars on afforestation, gardening, irrigation, grassland restoration, and the creation of an artificial lake (63). As a result, over 90 percent of the mined area has been restored and returned to Mother Nature (63). This company has been awarded the "Leading Rehabilitation Enterprise in the Mining Industry" award for consecutive years. As for the exemplary company itself, it is worthy of consideration, as significant contributions are shown below.

- **Responsible mining rehabilitation comprehensive project** (64)
    - Founding training base for rehabilitation in Toson mine
    - Toson mine - the 980-hectare is used. From that area, technical rehabilitation in the 833-hectare area and biological rehabilitation in the 538-hectare area.
    - With MUST, MP embedded bio-charcoal bucket in tree cultivation and forestry work.
    - Planting short and rare plant seeds. /Altai wild onion, licorice, etc/
    - An artificial lake that refreshes itself with fresh water and has seven different species of fish

On the other hand, the other most considerable success of the entrepreneurship of MP is exactly the upbuilding of the cement manufacture. A few years ago, Mongolia was developing the domestic production of cement needed for construction. It pursued an

intensive policy to eliminate its dependence on 80–90 percent of imports from its southern neighbor, China. As a result, Monpolymet made the decision to develop a sophisticated national cement plant and put the company's owned limestone deposit of Senjit Khudag in Urgun Soum, Dornogovi Province, into use. As a result, it offers 500 job openings to local citizens and plays a significant role in local development (63).

Overall, Monpolymet LLC has demonstrated a solid commitment to innovation and entrepreneurship and has undertaken several initiatives to promote sustainable mining practices, support the local community and foster innovation in the mining industry.

From this information, the general attitude toward innovation is continuously improving. Most companies are paying attention to technological developments, new technologies, and collaboration with other companies, institutions, and universities that bring new ideas, projects, and innovations. For further information, the case study of Mongolian large-scale companies OT and MP will be discussed in more detail.

3.2. Case Study and Research Analysis

As mentioned above, this section will provide a further analysis of the cases of Oyu Tolgoi and Monpolymet, two significant examples within the Mongolian mining sector. The selection of these companies was based on their large-scale operations and investment structures. Specifically, OT has foreign investment while MP has domestic investment, making them intriguing subjects for study. In relation to the present case study, interviews were conducted with representatives associated with the field of entrepreneurship and innovation at Oyu Tolgoi and Monpolymet. The interviews were conducted for one hour each. The interview questions were designed to assess the entrepreneurship of the company using various indicators, including innovation, agility, risk-taking, creativity, empowerment, growth mindset, result-oriented approach, and open communication. The interview questions are shown below.

Table 4. Interview questions

№	Indicators	Questions
1	**Innovation**	– What strategies and policies does the company use to differentiate itself from its competitors? – How does the company come up with new ideas? What inspired you to develop ideas? – Does the company collaborate with scientific institutions, universities, and international companies to carry out new projects in innovation, technologies, and experiments and implement them in their work? – Does the company collaborate with other emerging and novice (innovative) companies and startups? – Can you share a successful project your company has completed, how it came about, and how you measure the success of projects?

		– Does the company have a track record of successful innovation and disruption in its industry?
2	**Risk-taking**	– How does the company perceive risk? – What challenges did the company have to overcome at the beginning of its journey? I.e., lack of legal environment for rehabilitation then. – How does your company decide about uncertain things, such as pursuing new ideas or opportunities? What systems and structures are in place for pursuing new opportunities or ideas? – How does your company handle failure and risk-taking regarding new projects or initiatives?
3	**Creativity**	– What is unique about your business? – How does the company come up with new ideas? What inspired you to develop ideas? – How does the company foster creative thinking? – Can you give me an example of a successful implementation of an employee's innovative idea?
4	**Agility**	– What measures does your company take to stay ahead of competitors and maintain agility in the fast-paced world? – How does your company adjust its strategies and tactics to keep up with the latest trends and market conditions? – Can you share how your company has responded quickly and effectively to unexpected challenges or disruptions? – How does your company utilize technology and digital tools to enhance its agility in the field of entrepreneurship?
5	**Empowerment & growth mindset**	– How does the company select and recruit your team? – How does the company create a creative, open, free-thinking environment and organizational culture? – How does the company encourage employees to develop new ideas, and how do you reward them for their efforts? – How does the company support and develop its employees' leadership skills to benefit their work? – What do you do to encourage employees to maintain this mindset? – Can you give me an example of a successful implementation of an employee's innovative idea?
6	**Customer Focus**	– What strategies and policies does the company use to differentiate itself from its competitors? – What does your company focus on to create a competitive advantage? – How does the company react and respond to market change and customer needs?
7	**Open communication**	– How would you describe the communication culture in your company? Does your company actively promote an open and transparent communication environment? – What actions has your company taken to foster transparent and effective communication within the organization? – How does your company handle communication between different levels of hierarchy, internally among employees and externally with stakeholders? – How does your company ensure smooth communication and information sharing across various departments and teams? – What steps does your company take to identify and address any communication challenges or breakdowns that may occur, such as disagreements or conflicts, and how are they resolved?
8	**Result-oriented**	– How does the company define success, and how long did it take to find it? – What KPIs do you use to measure your progress or business success? – Can you share a successful project your company has completed, how it came about, and how you measure the success of projects? – How do you evaluate the past ups and downs of your business? – What are your achievements that are considered the first in Mongolia and setting up new standards? – How does the company plan on growing its business?

		– What goals are the company still working towards achieving?

Source: own source, 2023.

As previously stated, the data collected from the interview was analyzed through the application of the thematic approach in qualitative research. For conducting this kind of analysis, Braun and Clarke's (65) six-phase guide is a useful framework. The aforementioned stages are: Phase 1 involves familiarizing oneself with the data, while in Phase 2, initial codes are generated. Phase 3 involves conducting a search for themes. In Phase 4, the identified themes are reviewed. Phase 5 entails defining the themes, while Phase 6 involves the write-up of the findings. The method was utilized, and the prescribed sequence was followed to conduct an analysis. Based on the interviews, both have common aspects; thus, the general themes and codes derived from the transcripts are shown below.

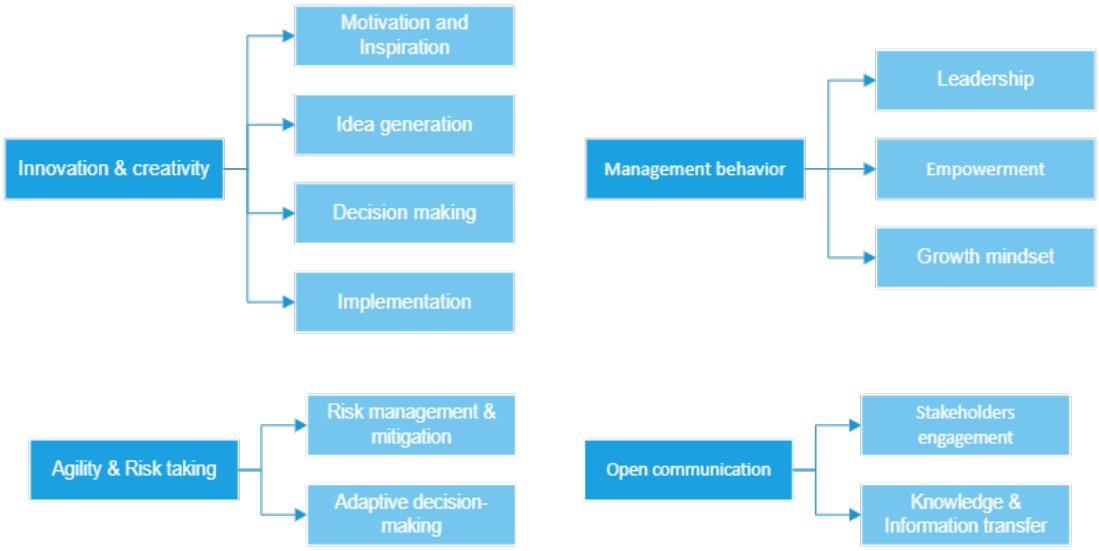

Figure 3. General themes and codes. Source: own illustration

3.2.1. Case: Monpolymet Group

Theme 1: Innovation and Creativity

Monpolymet is a national large-scale company with domestic investment. The primary objective of the MP is to prioritize environmental rehabilitation. The following theme and

support codes were derived from an interview conducted with T. Oktyabri, the head of the rehabilitation department of the company, regarding the entrepreneurial environment within the organization.

Monpolymet's innovation is driven by operational challenges encountered in its business. To address encountered issues, the organization conducts research to identify potential solutions both internally and externally. Innovative ideas and initiatives can originate from various sources such as internal departments, employees, external scientific institutes, experts, universities, and other companies. Knowledge exchange and solution finding are facilitated through the study of experience. Examples that support this assertion include:

1. The rehabilitation area known as "Toson" has shown a consistent increase in the number of trees over the years. As a result, the issue of irrigation arose. As the quantity of trees grows, the irrigated region expands beyond the capacity of manual traversal. Based on research conducted to address the issue, consultation with acquaintances, review of other projects, and knowledge gained from experience, the Namyang brand drip irrigation system from South Korea was implemented as suggested by the "Greenland" project. The selection of the aforementioned solution by MP was deemed most suitable for Mongolia during that period. The innovation has resulted in various outcomes, including the facilitation of human labor, time-saving, reduction of water loss, and acquisition of new knowledge. Maintenance is crucial for the growth of a tree during the initial three years, after which it can grow naturally. Based on the given information, it can be inferred that an irrigation system has a lifespan of 3 years and can facilitate the restoration of 10-20 hectares of land annually. The solution mentioned earlier has been implemented for a duration of 11 years and remains operational.
2. The Moncement plant implemented the WHR technology. During the construction of the Moncement plant, the selection of dry processing technology was based on a study that evaluated the environmental impact and economic benefits of various processing methods. The dry processing method was deemed to be the most eco-friendly and water-efficient option. The production of cement involves the blending of several minerals, which are subsequently subjected to high-temperature firing in furnaces. Water is utilized as a coolant for the furnace, resulting in the generation of significant amounts of high-temperature steam.

When hot steam is launched into the atmosphere, it can result in aridity in the surrounding region. To address this issue, the utilization of WHR technology has been implemented to use this waste steam to generate energy with a capacity of 5 megawatts. This energy output accounts for 40-45% of the overall energy consumption of the facility. The technology represents a pioneering development in Mongolia.

3. As per the terms of the cooperation agreement between the Agricultural Economy and Innovation Development Center (AEIDC) and MP, the latter has committed to undertake four key tasks.

Initially, MP collaborated with AEIDC to conduct research and experiments on bio-coal. This initiative aims to enhance soil fertility and reduce soil density through the utilization of its porous structure. Therefore, reclamation organizations have the potential to utilize it as fertilizer in areas with poor soil fertility.

The second item is a soil bucket composed of soil, biochar, humate, mineral fertilizers, and binding agents. Due to its composition, the soil provides all the essential nutrients required for the growth of trees. Consequently, it offers benefits such as non-invasive effects on the roots and immunity to environmental changes. Historically, tree planting was limited to the spring and autumn seasons. However, the utilization of the soil bucket has enabled an extension of the planting period from March to November annually. Historically, the workload has intensified during the planting season, resulting in a concentrated expenditure of both capital and labor resources. The problem was resolved by providing greater opportunities and time for tree planting.

MP subsequently has access to a seed bank that contains extremely rare plants from the eastern part of Mongolia. As per the statement of the representative, the research was conducted by Mr. Jamyandorj, a respected agronomist of Mongolia, who expressed his inability to continue the work due to his age and suggested that it be transferred to a suitable institution. This implies the existence of knowledge. It is proposed that the company, MP, expand its seed bank and cultivate specific varieties to meet its internal requirements.

The latest collaborative effort between AEIDC and the involved parties pertains to the advancement of seeding technology. The progress of the work is currently slow. The present study is focused on the cultivation of perennial pasture plants. The regeneration of Mongolian grasslands involves the utilization of 8–10 types of perennial plants. The

plants exhibit variations in both size and price, posing a challenge to achieving uniformity during the planting process. It is imperative to ensure an even coating on the seeds. In various international contexts, technology is extensively employed, particularly in the domain of horticulture. Conversely, in Mongolia, it is better suited for rehabilitation endeavors. The incorporation of this approach yields the greatest benefit in terms of cost reduction.

It is pertinent to acknowledge that MP played a pioneering role in Mongolia and established the groundwork for subsequent research endeavors, which generated significant value. Regarding the decision-making process, the departmental management responsible for implementing the improvement initiative takes an initial role. However, ultimate decision-making authority rests with the top-level management of the organization, thereby rendering the outcome contingent upon their determinations. During the interview, it was noted that "the establishment of separate departments can lead to various challenges, including time loss and delays in decision-making. In the context of problem-solving, individuals who are actively engaged in a given situation possess a unique understanding and expertise that cannot be replicated by others.". Consequently, the organization has no dedicated department responsible for tasks related to entrepreneurship and innovation. During the implementation stage, financing is determined through investment and loan decisions. Typically, investments are made collectively, whereas loans are obtained from the European Bank for Reconstruction and Development of Mongolia. According to the delegation, Environmental, Social, and Governance (ESG) is considered the primary criterion for meeting the credit standards of the European Bank for Reconstruction and Development (EBRD). Since 2015, the organization has been providing ESG. The aforementioned concept has been a topic of discussion in Mongolia for the past two years. Based on the aforementioned, companies can potentially develop solutions to their issues and implement them independently, without the need to wait for the legalization of said solutions within the country, provided that they are motivated to do so. In the context of team building, certain limitations exist, including the experts' inadequate comprehension of their field and insufficient practical exposure. Both the implementation process and its results are subject to quality management by MP. The organization is utilizing Kaizen and ISO methods in its operations. Through the use of these tools, the implementation is monitored, corrected, and improved.

Theme 2: Management Behavior

As previously stated, since management is the one who makes all final decisions, their actions have a significant impact on a company. The theme was developed with a specific purpose in mind. In the context of MP, the leadership style of management is characterized by leading through demonstration and guidance rather than through directives. Upon its inception, MP exhibited certain limitations and was not as remarkable as its current state. During that period, the notion of environmental rehabilitation was insufficiently developed in Mongolia. In 2007, the MP management team traveled to Germany to study the experience of BGR and gain new knowledge from the environment. Furthermore, MP has conducted multiple rehabilitation demonstration training and trained over 20 environmental rehabilitation trainers, drawing from its extensive experience in the field. Furthermore, within the context of collaborating with scientific institutions, the "Toson" rehabilitation area has been established as a demonstration training base for rehabilitation. This provides students from various universities with the opportunity to conduct research and analysis in an unrestricted manner. It is believed that the MP disseminates its knowledge and positive experiences to society, exhibiting a mindset that introduces novel concepts and opportunities to the public.

Theme 3: Agility and Risk-Taking

The utilization of basic techniques is common in the context of risk management and mitigation. The primary inquiry pertains to the perception of risk. The concept of MP suggests the presence of obstacles to be surmounted and inherent risks in all endeavors. Consequently, the perception of risk is viewed in a positive light. Successful completion of work undertaken after taking a risk can mitigate potential future risks, thereby presenting an opportunity for advancement to the next level. As such, risks are often viewed as opportunities for growth. Depending on the organizational structure of a company, a dedicated department for managing risk may not exist. In such cases, each department assumes responsibility for identifying and mitigating its own operational risks.

The organization also employs the Kaizen approach, which fosters a culture of ongoing improvement and education. This involves all levels of the organization and empowers employees to identify and implement small, incremental changes. The shared principles between company agility and the aforementioned concept include:

- Both the Kaizen and the agility methodologies place a heavy emphasis on continuous improvement. It involves the constant search for opportunities to enhance processes, products, or services.
- The concepts of adaptability and flexibility acknowledge the necessity of being able to adjust and accommodate changes, be it in customer demands, market circumstances, or internal operations.
- The methodologies of Kaizen and agile promote the empowerment of employees and their active participation in the identification of opportunities for improvement and the implementation of corresponding changes.
- The two approaches endorse an iterative methodology for addressing problems and enhancing performance, which involves dividing complex tasks into smaller, more manageable units.

The organization engages in continuous research of industry trends, advanced technologies, and methods to maintain flexibility and agility. In the realm of management, there is a continuous effort to develop, train, and motivate both the manager and their subordinates.

Theme 4: Open communication

In terms of open communication, MP has no siloing between departments. The establishment of a culture that is both free and open within the organization has facilitated unrestricted communication and expression of ideas, as well as effective management of work. It is imperative to acknowledge that problems can arise for individuals in any location. Therefore, fostering an attitude or culture that does not dismiss issues as being outside of one's responsibility is crucial. Adopting a mindset that recognizes that problems are not solely the concern of the individual affected but also of the wider public or company, and providing assistance without hesitation, is essential. Therefore, the occurrence of communication and information delays is avoided. Also, as for community engagement, MP always introduces and reports its operational information and its consequences to the public in the local community. They organize different events and courses to provide knowledge and understanding to the community and support local development. For instance, the high hardness of Gobi water necessitates the construction of water purification and filtration facilities. Such facilities serve the dual purpose of providing free water for factories and workers, while also ensuring the consumption needs of the area are met. The facility employs an RM membrane, which is noteworthy for being the first of its kind in Mongolia.

As a result of this case study, the general thematic map of MP innovation was illustrated.

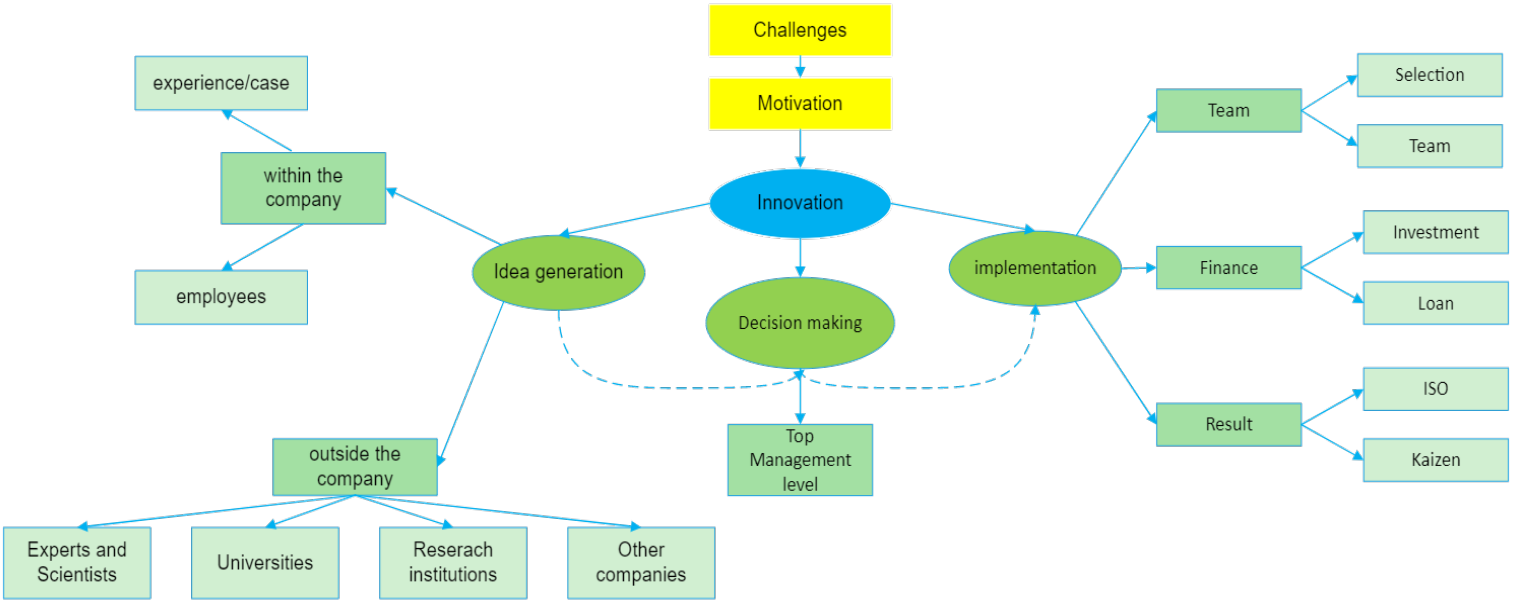

Figure 4. Thematic map of innovation at Monpolymet. Source: own illustration

3.2.2. Case: Oyu Tolgoi

The joint-ownership company, Oyu Tolgoi, adheres to the legal framework of Mongolia and is under the management of Rio Tinto. Since Rio Tinto is a large multinational group, innovation is often discussed at the group level. Because innovation is understood in connection with a larger scope and technical direction. But for the OT, it means that they usually go by the concept of improvement. The organization itself requires constant improvement and innovation, thereby endorsing individuals known as entrepreneurs or initiative owners.

Theme 1. Innovation and Creativity

In this context, the organizational structures of OT are typically in accordance with the policies and guidelines of Rio Tinto. The development and comprehension of entrepreneurial and innovative instincts are more pronounced in multinational corporations, which typically have dedicated structures and organizations responsible for related work. Regarding OT, the responsibility lies with the Business Improvement and Transformation department. Generally, management is executed through a hierarchical structure where the lower-level management oversees the process of improvement, devises the yearly plan, and provides reports to the higher-level management. This

approach ensures a balance between the organization's revenue and expenses. The department will comprise three teams, as illustrated in the figure below.

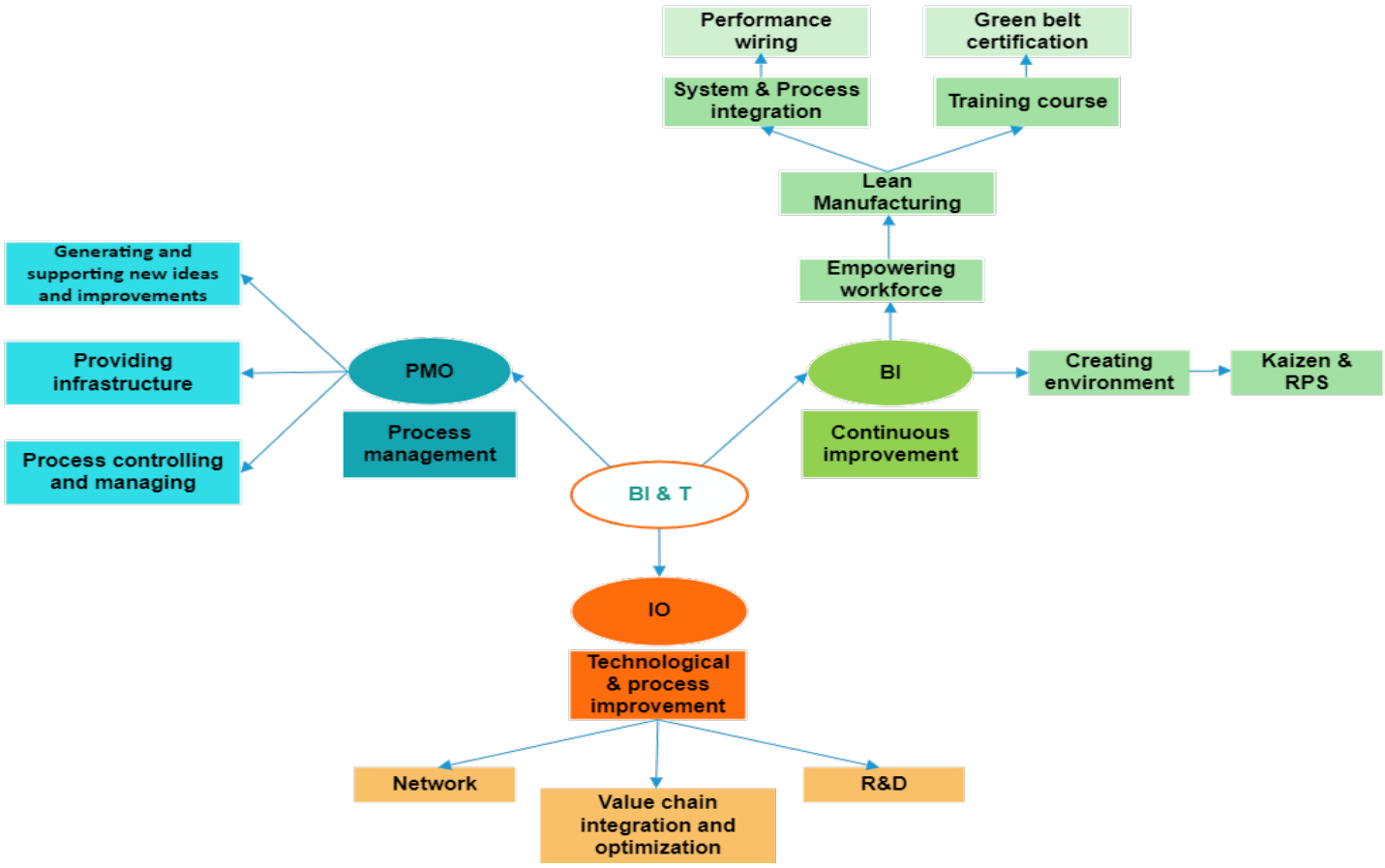

Figure 5. BI&T function structure. Source: own illustration

1. The first team is the Process Management Operations (PMO) team, which typically functions as a process-focused unit that provides support, supervision, and infrastructure for the implementation of new ideas, initiatives, and enhancements.
2. The subsequent team is the Business Improvement (BI) team, which focuses on achieving continuous improvement and is closely aligned with the principles of lean manufacturing. The team is accountable for enhancing the synchronization among the systems and procedures of the organization and supervising the activities associated with performance wiring. The focus of the tasks to be done, such as an inquiry as to whether or not there is effective communication between management-level meetings, is whether there is an unrestricted flow of information both upward and downward. Are the key performance indicators (KPIs) cascading effectively throughout the organization? etc. One example of how lean management is utilized

to empower employees is through the organization of green belt certification training by OT, which involves the invitation of skilled black belts from Rio Tinto to provide instruction on business development and project management. The problem-solving approach employed involves the utilization of Kaizen and RPS methodologies, encompassing training, events, and infrastructure. In summary, the team is divided into two subteams, with one group focused on establishing a conducive environment and the other dedicated to empowering individuals.

3. The final team is referred to as Integrated Operations (IO). The team prioritizes technical and technological tasks, which can be interpreted as primarily engaging in ongoing research and development, optimizing value chain integration, and enhancing network performance. The method known as Advanced Analysis is being implemented within the scope of these studies. It is a more effective approach that involves the creation of nodes within the value chain and their subsequent connection, as well as the analysis and resolution of related issues.

Rio Tinto's initial approach to idea generation involved the Pioneer Pitch, as previously discussed. Rio Tinto's structure involves two primary methods for generating ideas:

One approach involves conducting an annual workshop in which the manager convenes with subordinates to gather their insights. Following the collection of ideas, the manager in charge selects viable options that are appropriate for the operation. Once a set of options has been identified, financial and risk assessments are conducted to evaluate the benefits, significance, profitability, and feasibility of the proposals. Subsequently, the individual responsible for the approved and selected ideas is provided with the necessary support and infrastructure to fulfill their requirements. Upon completion of the project, a financial evaluation is typically conducted to assess the extent to which the initial objectives have been met.

The subsequent strategy entails the development of complete potential or elevated tiers of administration on a grander scale. The activity in question is conducted at intervals of 2–3 years rather than being a continuous occurrence. The concept of full potential is often approached by identifying the maximum attainable level through concerted effort. Upon identification, what actions are required to accomplish the task? The aforementioned question is primarily regarded. The utilization of two distinct approaches for idea generation can be attributed to the emphasis placed on entrepreneurship over the current opportunities and resources, the significant financial resources required, as

well as the potential need for a shift in one's current work. This workshop is being conducted with the participation of individuals from RT. The investigation of areas of capability and expertise is pertinent to the discussion of maximizing potential, which is why they have been invited to attend. Thus, RT provides a center of excellence or hub comprising subject matter experts. At present, there are four primary hubs that operate based on their collective expertise. The process of idea generation typically involves these two broad approaches:

In the context of decision-making, the structure of RT is presented in a matrix format. As members of a larger ecosystem, adherence to the principles of the system is obligatory. It can be argued that organizations with hierarchical structures tend to have more complex decision-making processes due to the involvement of multiple levels of authority. On the one hand, the process can be time-consuming; therefore, tasks are frequently pre-planned. Furthermore, instead of generating novel concepts, OT utilizes improvements and endeavors that have been effectively executed at the collective level. As an element of a broader system, it is linked to all RT portals, enabling replication through the utilization of examples from the roster of initiatives and enhancements executed at the group level.

Theme 2: Management Behavior

As in every business, the impact of the leader is significant because it is closely related to the philosophy of the organization. The organization prioritizes robust leadership that fosters honesty, responsibility, and a safe working environment. Rio Tinto places a strong emphasis on ethical behavior, adherence to rules, and responsible decision-making throughout all of its operations. The leadership of the organization prioritizes the health, safety, and well-being of its employees, along with the preservation of the environment. The organization also advocates for diversity, inclusion, and equal opportunity. Rio Tinto promotes a culture of open communication, collaboration, and teamwork to facilitate an environment where employees can effectively contribute their expertise and ideas. Rio Tinto endeavors to ensure operational excellence, sustainable practices, and long-term success in the mining industry through the promotion of leadership and management behaviors. In order to empower human resources, OT provides a program that gives the opportunity to shift to work within the Rio Tinto community and provides different training courses, convenient working environments, and supplies. Thus, OT always stays on top of a highly engaged workforce at the group level.

Theme 3: Agility and Risk-Taking

The enhancement of agility is a key objective for Rio Tinto, a multinational corporation specializing in mining and metals. To achieve this goal, the company has implemented various strategies. The organization promotes iterative development and adaptability by embracing agile methodologies. Because they encourage iterative development and adaptability, agile methodologies are popular in organizations. Cross-functional cooperation and adaptable organizational structures can help with effective communication and prompt responses to changes. An organization's dedication to continuous learning, adoption of technology, and customer-centric approach all help to increase its agility. Rio Tinto maintains a corporate culture that values experimentation and embraces calculated risks through the cultivation of an agile mindset and leadership behaviors. Although there may be variations in specific practices, the aforementioned initiatives collectively equip Rio Tinto with the ability to effectively navigate market dynamics and meet the changing expectations of its customers.

Risk management is considered a critical aspect of operations by RT. Risk management is approached through the implementation of comprehensive strategies and frameworks that enable the identification, assessment, and mitigation of risks. Rio Tinto has adopted a proactive approach to risk management, with the objective of early identification of potential risks and the implementation of appropriate measures to mitigate their impact. Various tools and techniques are employed to analyze risks, such as risk assessments, scenario planning, and the integration of risk management into decision-making processes. Rio Tinto prioritizes risk management to ensure employee safety, environmental protection, operational resilience, and reputation safeguarding. In these regards, RT has a separate unit that is responsible for the mentioned tasks.

Theme 4: Open communication

Rio Tinto's Oyu Tolgoi mining project in Mongolia, which is based on this theme, recognizes the value of involving stakeholders in its operations. The project endeavors to establish and uphold favorable relationships with diverse stakeholders, encompassing local communities, governmental authorities, non-governmental organizations, and indigenous groups. The Oyu Tolgoi project employs a collaborative strategy that engages stakeholders in decision-making procedures and solicits their feedback on significant matters. Open and transparent communication is prioritized to promote comprehension and address the concerns of stakeholders. The project incorporates social investment initiatives that prioritize education, healthcare, infrastructure, and

economic development to enhance the welfare of nearby communities. The stakeholder engagement initiatives of Oyu Tolgoi are indicative of the company's dedication to responsible mining practices, sustainable development, and the establishment of mutually advantageous relationships with its stakeholders. Additionally, between the RT and OT, information and knowledge transfer freely.

Based on the analysis, the general thematic map of innovation at OT is illustrated below.

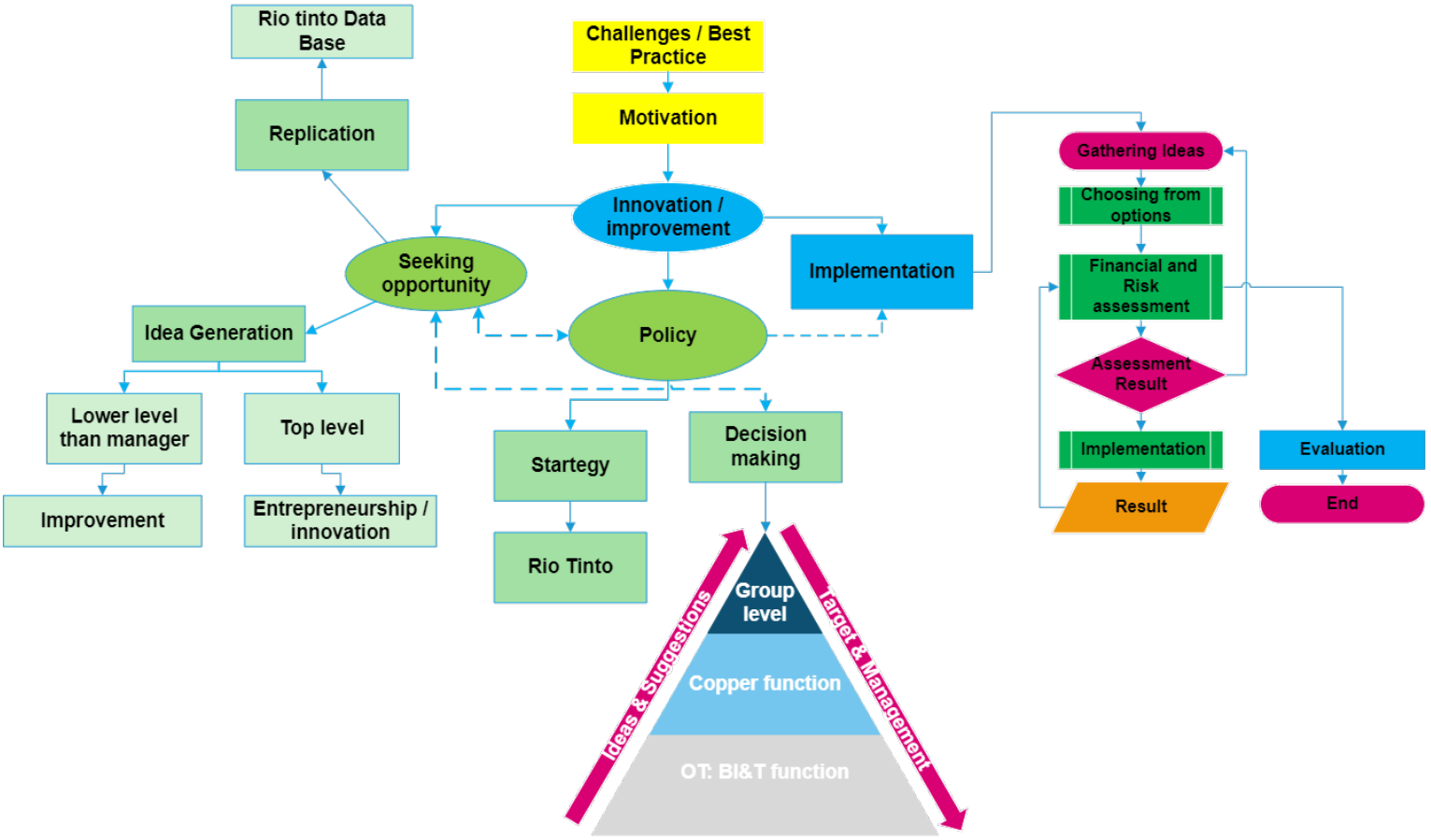

Figure 6. Thematic map of innovation at Oyutolgoi. Source: own illustration

Discussion

Despite the lack of a distinct understanding and delineation of the entrepreneurial spirit within Mongolia's mining industry, these companies' strategies are consistent with the aforementioned structure, demonstrating that it has already developed within the ecosystem. Despite differences in approach, structure, and experience between the two companies, one national and the other foreign-invested, it is evident that they share a common structure in terms of innovation. The primary distinction lies in the fact that MP is creating a distinct ecosystem, whereas OT is integrated within an existing, broader ecosystem. The comparison between MP and OT reveals significant differences in their

organizational structures. Unlike OT, MP lacks a dedicated innovation department, with innovation, improvement, and risk management is the responsibility of the main departments. Conversely, OT operates within a more systematic organizational framework, with specialized departments in their respective fields. Additionally, decision-making in MP is characterized by a direct organizational approach, while OT's hierarchical administration is associated with a certain level of bureaucracy. Furthermore, with regard to the mindset of the indigenous population, it has been observed that Mongolians exhibit a tendency towards idleness, leading them to simplify or adapt things to conform to their cultural norms, a practice commonly referred to as "Mongolization". The utilization of this approach may yield benefits in terms of technical and technological advancements; however, it also entails certain drawbacks. The case of Monpolymet involves a discussion of environmental remediation, which is deemed unsuitable for management due to its potential impact on living organisms. Because when dealing with living things, you can't skip any necessary steps. In the context of occupational therapy, an individualistic approach that disregards the interconnectedness of the larger system is deemed detrimental to the effectiveness of the systematic organization and organizational policies. In addition, although innovation takes place more at the reclamation stage of the mining life cycle, the interviewees from both companies said that there is a lot of opportunity for innovation at any stage. During the exploration phase, various technological advances were introduced, including magnetic exploration and satellite-based exploration techniques. At the extraction stage, more productive innovations are created. But it is more possible at the raw material processing stage. There is a lot of potential for innovation in beneficiation technologies and changes in the number of ingredients depending on the mineral. In general, the existence of ample opportunities at all stages was noted. However, the reason for the lack of innovation in Mongolia's mining sector is, firstly, the lack of desire to seek new things; secondly, the impact of economic incentives; and thirdly, the lack of knowledge and skills. Insufficient personnel and an inadequate legal environment are the primary challenges encountered in Mongolia.

Conclusion

Based on the cases, the answers to the research questions are as follows:

1. What actions or approaches in existing mining projects can be characterized as innovative? And why?

In the Monpolymet case, the following actions and approaches can be characterized as innovative:

- Implementation of the Namyang brand drip irrigation system from South Korea to address the issue of irrigation in the rehabilitation area known as "Toson." This solution was based on research, consultation with experts, and knowledge gained from experience.
- Adoption of WHR (waste heat recovery) technology at the Moncement plant to utilize waste steam and generate energy, resulting in environmental and economic benefits.
- Collaboration with the Agricultural Economy and Innovation Development Center (AEIDC) to conduct research on bio-coal, develop a soil bucket for tree planting, expand the seed bank, and advance seeding technology for grassland regeneration.

In the Oyu Tolgoi case, the following actions and approaches can be characterized as innovative:

- Implementation of various teams within the Business Improvement and Transformation department, such as Process Management Operations (PMO), Business Improvement (BI), and Integrated Operations (IO), to focus on continuous improvement, lean manufacturing principles, technical tasks, and value chain integration.
- Utilization of idea generation methods, including annual workshops and financial/risk assessments, to gather insights and evaluate the feasibility and profitability of proposals.

These actions and approaches are considered innovative because they involve the adoption of new technologies, research-based solutions, collaboration with external entities, and a focus on continuous improvement.

2. How did these actions and approaches evolve? What were the enabling factors (policies and strategies, technological and human resources, etc.)?

The evolution of these actions and approaches in both the Monpolymet and Oyu Tolgoi cases can be attributed to several enabling factors:

- Identification of operational challenges and the need for solutions: Both companies encountered specific challenges in their mining projects, such as irrigation issues and environmental impacts. These challenges drove them to seek innovative solutions.

- Research and knowledge exchange: Both companies engaged in research activities, both internally and externally, to identify potential solutions. They also sought knowledge and expertise from scientific institutes, experts, universities, and other companies.

- Collaboration and partnerships: Monpolymet collaborated with the Agricultural Economy and Innovation Development Center (AEIDC) to undertake research and experiments. Oyu Tolgoi benefited from its connection with Rio Tinto, a multinational group, which provided access to resources and expertise.

- Availability of resources: Technological resources, such as the Namyang drip irrigation system and WHR technology, played a role in enabling innovative approaches. Human resources, including experts, agronomists, and trainers, contributed to the development and implementation of innovative solutions.

- Management support and decision-making: In both cases, top-level management played a crucial role in decision-making and supporting innovation initiatives. Their leadership and guidance provided the necessary support for implementing innovative actions and approaches.

3. Has any indigenous entrepreneurial mindset been applied in solving mining project problems?

However, it is worth noting that Monpolymet and Oyu Tolgoi engaged in collaboration with local institutions, such as the Agricultural Economy and Innovation Development Center (AEIDC) in the case of Monpolymet. This collaboration suggests an openness to incorporating local knowledge and expertise into problem-solving processes. At least it expresses some kind of indigenous entrepreneurial mindset.

4. In which part of the mine life cycle is innovation most likely to occur?

Based on the information provided, there is a high possibility that innovation occurs throughout all stages of the mine life cycle in both cases. Also, the representatives of both companies highlighted this too.

Recommendation

First of all, this thesis aims to study entrepreneurship in the Mongolian mining sector, especially the innovation ecosystem, and I hope that this work will be useful for future research projects.

In the Mongolian mining industry, the ecosystem of entrepreneurs and innovation has developed to a certain extent, but most organizations do not have enough understanding of these terms because they do not go by their names. However, the terminology is relatively developed in large group organizations, so it would be fine if efforts were made to popularize this concept.

In addition, it is unfortunate that the issue of personnel is being discussed in Mongolia. Because scientific and educational institutions cannot provide sufficient quality knowledge. Consequently, the labor market is being supplied with specialists of low quality. Also, it is better for educational institutions to focus on these things, as they require multifaceted knowledge and practice.

The most difficult problem is that large, competent organizations operating in the Mongolian mining sector do not disclose much of their information to the public. That's why it's a good idea for companies to put information on their websites that can be shared with researchers and the public, just like other major organizations around the world.

Finally, I thought it would be good to create a publication containing the best practices of large companies in order to give ideas to entrepreneurs operating in the field.

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64. Байгаль орчны нөхөн сэргээлтийн алба [Internet]. Монполимет Групп. 2022 [cited 2023Apr27]. Available from: httpIn conclusion, this comprehensive essay aimed at addressing a set of research questions related to various contemporary topics spanning education, climate change, technology, and leadership. The guiding questions sought to bring clarity to the ongoing debates and contribute to a better understanding of the complexities associated with these issues. By synthesizing research-based knowledge, experiences, and observations, the analysis led to the following conclusions:
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