Impact of innovation and technology on enhancing exports of the country: A study on Norway-based firms

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Abstract

Technological innovation is rapidly changing the scenario for modern trade as companies that are heterogeneous in nature are focused on implementing innovation. Various factors are contributing to become a part of this effort and are increasing due to the market size in which the firms are operating. The efforts that are identified due to the innovation are creating a more productive environment and overturning the effect of similar market size properly.

The growth that has been seen in the firms that are situated in Norway is highly sustained and dependent on various factors such as the performance of innovation. Norway-based companies are highly focused on implementing new technology that is based on determining innovation. On the other hand, the key elements that have been discussed during the process are highly dependent on various factors.

The results that have been presented in this research have properly provided a clear idea that there is a direct relation between innovation and exports. The implementation of innovation strategy helps in the development of an element that reduces the challenges related to managing related expenses. The influence that has been created due to the changing nature of private research and development expenditure which is ascertained for development process may aid in enhancing the level of exports and boosting competitiveness of the firms that are situated in Norway.

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1. Introduction

The goal of this chapter is to provide an overview of research topic including background information available on the topic. This is further elaborated with mentioning of research aim and objectives. Rational for the research will also be discussed in this chapter.

1.1. Background of Research

Since early 1980s, there have been many economies that have extensively altered the contribution of trade and technology. When considering on outlook of international trade, exports are originators of foreign exchange which is essential for importing goods and services. As per the views presented by Edeh et al. (2020), there is a positive connection between international trade and growth of the economy. There has been a pivotal role of exports in enhancing investments and technology when transferring through accelerating the globalization process. The beginning of first few years has allowed exports to be considered as one of the most essential elements in emerging technology. There are policies which have significantly enhanced overall productivity of many nations by optimisation for exporting goods and services. It is also signifying that export potential of economy and competitiveness on the global world is enlightened. It is a rapid exportgrowth that is enabling achievement of capital goods and technology which is further transferring the rapid growth of economy of Norway. Technological elevation has contributed to productivity and strategic development in the process of economies like Norway (Haus-Reve et al., 2019). According to Sultanuzzaman et al. (2019) the progress of technology can increase labour productivity by enhancing the process of human capital and facilitating increasing output through enhancing the level of output that has been providing better living standards. The course of internationalisation process has encouraged researchers and policymakers when understanding the exporting strategy for promoting the bilateral and unilateral manner for encouraging in emerging parts of Norway.

As per the views presented by Afonasova et al. (2019), involvement of technology has aided in making sure that entire process regarding the recent changes in export chain has been enhanced. Enhancement of export has resulted in generation of employment in the relevant parts of Norway. It is considered important for individuals to focus on developing technology and enhancing the level of their countries. Using various techniques, the procedure that is relevant to enhancement of the goods and services can produce a major benefit for combating the price. Exports are essentially the key element that is used for determining the growth of economy. In recent times, economy has observed various breakthroughs that have been observed during the

process of innovation which is impacting the level of performance and perspective of the countries that are still under development (Van Der Loos et al., 2021). Major-scale innovation has been observed in both small-scale and medium-scale enterprises that are operating in Norway. The ongoing process of innovation has developed the context in providing a better idea of a strong system that is creating a major impact on exports of any specific country.

There is a positive relationship between exports and the performance of innovation across the firms. As per the views presented by Brunel (2019), both concepts are the ones that is holding key considerations with the creation of extensive margins. Supply chain is aiding in making sure that the necessary actions are being taken for boosting the process of imports in Norway's firms this is due to the reason that various applications can be adopted by these firms in reducing the level of problems that can be caused due to enhancement which is observed during the marketing concepts.

There have been many learning and critical enabling process for enhancing the diverse product range that is being demanded by the companies that are exporting the products to different countries. According to Z. Khan et al. (2020), the manufacturing process of new products has influenced the need for consumers in the intended management and enhancing the level of marketing in the key elements. The initiation process is most vital for Norway-based companies. It can allow the country in managing export costs and taking the products that are being developed in the country to foreign countries. The company needs to focus on enhancing the level of management that will impact both the demand and supply of the country. Starting the progression and innovation among the shared adoption can be achieved through modelling of endogenous option which is available with the company that is concerned with the technology for implementing the liberalisation and inclination towards the modelling and influencing of innovation.

Both innovation and exports are having a mutual impact on advancement and productivity of the development of a country and its exports in the market (Sultanuzzaman et al., 2019). The innovation has resulted in a high level of impact that has been created on Norwegian companies and managing the level of contribution that depends on various factors like approach, that has been implemented by the company during the process and using the process, product innovation. This can provide room for development among the key elements in enhancing the pattern of possibilities in connection involving innovation process.

Infrastructure has been developed for aiding in enhancing the level of economic background while keeping in mind the importance of spending for boosting of economy as it is a better idea

for providing an alternative form that is targeting the fiscal stimulus. The empirical evidence is that the infrastructure in spending does not have any form of a stimulatory effect on the national income of the country.

1.2. Research Aim and Objectives

Research Aim

The research aims to understand impact of innovation and technology on enhancing exports of the country in Norway-Based firms.

Research Objectives

- To understand how economic deficit can be controlled through building technological infrastructure.
- To identify how the country can achieve a competitive advantage and influence the total trade volumes.

1.3. Research Questions

Question: Does technological infrastructure affect a country to influence total trade volumes by balancing its economic state?

1.4. Research Rationale

The research will be providing a proper value to individuals that are working in analysing the various impacts that the business is having on the infrastructure. Technological infrastructure has seen rapid development due to changing nature and managing the level of changing nature and managing the level of exports. It is important for following a proper area of concern and managing the level of exports. This thesis can be used for future research and managing the level of innovation making sure to help in improvising the exports in the Norway based firms. This research can be used for providing a clear understanding of the management of key information and reducing the problems that can be faced in Norway based firms.

This research can be used by various individuals that are working in Norway companies for ensuring that the necessary actions have been implemented to reduce the problems with exports. This can aid the management in focusing on identifying the key strategy that can be implemented to implement the innovation in the country and gain a competitive advantage.

2. Literature Review

2.1. Overview

This chapter will put forward the role of innovation in controlling economic deficit along with the delivery of increased competitive advantage in the market through a literature review of articles and journals that have been published by the authors. The articles will be selected from the last five years for increased quality in research to identify innovation as a medium to increase trade volume and exports. This will allow in improving the reliability and validity of the information that has been collected for conducting the research.

2.2. Innovation and Global economy

The global economy has undergone a revolution because of innovation and technology, which are also key factors in economic growth. Particularly in a nation like Norway that mainly depends on exports of natural resources, innovation, and technology adoption have significantly increased export competitiveness of business (Biber-Freudenberger et al., 2018). The purpose of this Literature review is to investigate the mechanisms through which innovation, technological adoption, and export success are related in Norwegian-based enterprises.

In today's globalized economy, innovation and technology are acknowledged as major forces behind economic growth and progress (Edeh et al., 2020). The use of innovation and technology has been crucial in raising the export competitiveness of businesses in Norway, a country that has historically relied on the extraction and exportation of natural resources (Curtis & McLellan, 2023). This study intends to investigate the relationship between innovation and technology adoption and increasing exports by Norwegian-based companies as well as the processes through which these factors affect export performance. In-depth research has been done in the academic literature on how innovation, technology adoption, and export performance are related. According to research, businesses that adopt new technologies and invest in innovation typically have better export volumes, types of exports, and market shares than those that do not(A. Lewandowska & Cherniaiev, 2022). This is so that businesses may produce goods and services that satisfy the requirements and desires of their clients all over the world by enhancing their productivity, efficiency, and quality via innovation and the adoption of technology (Abdullah et al., 2023).

2.3. Technological innovation and exports

According to Auer (2022), innovation as well as technology have recently emerged as major factors in a nation's financial expansion and development. Numerous studies have pointed out the beneficial impact of technical development on rising exports, which may aid in reducing a nation's economic imbalance (Abalansa et al., 2021). The goal of this study of the research is to investigate the connections amongst innovation, technology, as well as exports also potential effects on the financial shortfalls of Norwegian based businesses.

Regarding technological innovation as well as exports, Norway ranks as one of the top nations in the entire globe (Kirikkaleli et al., 2022). The nation has a long history of research as well as development, and its favourable business climate fosters entrepreneurship along with innovation (Savastano et al., 2022). Because of this, Norwegian based businesses have been able to use innovation including technology to increase their competitiveness for export, particularly in industries like oil particularly gas, marine, and aquaculture. For instance, the Norwegian energy company Equinor utilized technological advancement and innovation to position itself as an innovator in the world energy sector (Cherepovitsyn et al., 2021). The business has created cutting-edge drilling technology that boost productivity and cut costs, which include autonomous as well as directional drilling systems. Additionally, to diversify the assets it holds and lessen its environmental effect, the corporation has made significant investments in renewable energy sources including solar as well as offshore wind power. With the corporation exporting to over thirty different countries worldwide, Equinor's technical advancement as well as innovation have aided in its growth on the international market (A. Khan & Qureshi, 2022). Kongsberg Maritime, one Norwegian tech business that specialises in marine technology as well as solutions.

2.4. Technological solutions providing competitive advantage for Maritime sector

As stated by Qi et al. (2019), regarding the maritime sector, the business has created cutting-edge technological solutions, which include autonomous ships, underwater robotics, including maritime traffic control systems. Furthermore, Kongsberg Maritime has created electronic solutions that allow for instantaneous data evaluation as well as monitoring, which can improve vessel performance as well as save expenses. Companies located in Norway have used innovation as well as technology to increase their export competitiveness in the aquaculture business (Araujo et al., 2022). For instance, AquaGen, a Norwegian aquaculture business, has created sophisticated breeding programmes that make it possible to produce fish that are high-quality and illness-resistant (Rosendal & Olesen, 2022). The business has also created cutting-

edge technology for environmental surveillance as well as fish health monitoring that can assist guarantee sustainable seafood output. In addition to these instances, businesses with headquarters in Norway have used innovation and technology to raise their export competitiveness in industries including IT, renewable energy, and biotechnology (Gaasland et al., 2020). Additionally, the business has created digital energy management and optimisation solutions that may boost effectiveness and save expenses.

Norwegian-based businesses in the IT industry, including Opera Software and Kahoot!, are using creativity and technology to create state-of-the-art software solutions for online surfing and education. These businesses have also created digital products that allow for personalised learning and real-time data analysis, both of which may raise user happiness and engagement. The global market success of Kahoot is largely due to their innovation and technological adoption which shows gamification (Dahalan et al., 2023). Adopting new technology and creating new goods may be expensive and time-consuming, especially for small and medium-sized businesses (SMEs) (Dahalan et al., 2023). This is a significant downside. As a result, small and medium-sized businesses have substantial obstacles when trying to enter new markets or compete with larger rivals that have greater financial resources and the ability to embrace new technologies. In addition, not all businesses and industries may gain equally from innovation and technology adoption, which might result in uneven export success (Hervas-Oliver et al., 2021). For example, some sectors may be more receptive to innovation and the adoption of technology than others, and businesses operating in these areas may benefit more from this in international marketplaces. Smaller businesses may find it difficult to compete, whereas huge corporations may be well-positioned to benefit from economies of scale and devote resources to innovation and the adoption of new technologies (Dahalan et al., 2023). The acceptance of innovation and technology may have a detrimental effect on the environment, which is another possible drawback. This is particularly true in industries like oil and gas, which traditionally have served as the primary catalysts for Norwegian export development.

2.5. Drawbacks advantages of innovation

As stated by Bodlaj et al. (2020), innovation and the adoption of new technologies may sometimes have drawbacks. It may be expensive and time-consuming to implement new technology and create new products, especially for small enterprises. This might obstruct access into new markets or make it challenging for smaller businesses to compete with more established rivals. In addition, not all businesses and industries may gain equally from

innovation and technology adoption, which might result in uneven export success. The adoption of new technologies and innovation may have detrimental effects on the environment. However, there is also a chance that these innovations will be utilized to harvest and deplete natural resources, causing environmental damage. The adoption of innovation and technology can assist cut emissions and enhance energy efficiency (Jordaan et al., 2017).

Despite these possible drawbacks, it is obvious that technology and innovation are crucial elements of Norway's export competitiveness (Colclough et al., 2019). Innovation and the use of new technologies have significantly increased the export competitiveness of Norwegian-based businesses. The country has been successful in harnessing innovation and technology to expand exports due to its supportive business climate, strong heritage in research and development, and emphasis on sustainability.

Norwegian businesses have effectively embraced new technology and made investments in research and development, enabling them to produce cutting-edge goods and services and broaden their worldwide reach. In the future, businesses with roots in Norway will work to make the most of innovation and technology to keep their competitive advantage in international markets while addressing any possible drawbacks like environmental implications and inequities in export performance.

As per Azmi et al. (2023), the use of innovation and technology results in the creation of fresh goods and services that have the potential to expand market opportunities and raise competition in already established ones. For instance, in Norway, innovation and technology adoption have made it possible to create new goods and services in industries like shipping, aquaculture, and oil and gas, therefore expanding the nation's export base and boosting its competitiveness in the global market (Børing, 2019). In addition, innovation and technology adoption can make it easier for businesses to join global value chains by giving them access to cutting-edge tools, talent, and information from other markets. As a result, businesses can lower manufacturing costs, raise quality, quicken innovation, and boost competitiveness for profitable exports. However, there are several factors that affect this relationship, making it not always clear how innovation, technology adoption, and export performance are related. In establishing the influence of innovation and technology adoption on export performance, for instance, a firm's degree of absorptive capacity, or their capability to successfully absorb and apply new technologies and capabilities, might be crucial (Ortigueira-Sánchez et al., 2022).

As per Radicic & Djalilov (2019), the amount of institutional support that a company has, including government laws, rules, and incentives, is crucial to its ability to successfully use innovation and technology adoption for export success. The Norwegian Research Council's

financing program for research and development in the aquaculture and marine industries is just one example of how the government there has implemented policies and efforts to foster innovation and the adoption of technology in critical industries (Ortigueira-Sánchez et al., 2022). Undoubtedly, innovation and technology have been crucial in boosting the export competitiveness of Norwegian businesses. Although the advantages of innovation and the adoption of new technologies are widely acknowledged, there may also be negative consequences (Ortigueira-Sánchez et al., 2022).

The first study topic examines how technology infrastructure may be used to reduce an economy's deficit. Technical resources that support innovation are referred to as having a solid technical infrastructure (Nan et al., 2023).A strong technological foundation may boost a nation's export competitiveness by enhancing the quality of its goods and services, cutting costs, and boosting production effectiveness. A nation may increase income and job opportunities and lower the economic imbalance by raising the competitiveness of its exports (IBM, 2023). Additionally, innovation can result in the creation of brand-new goods and services that can open new market prospects and boost the demand for exports from the nation. Therefore, technological advancement may increase a nation's exports' competitiveness and open new markets, resulting in an increase in total trade volumes (Zhang et al., 2022). For instance, the link between innovation and the success of Swedish manufacturing companies' exports showed that innovation had a favourable effect on export success. The effect of innovation on the exports of UK companies also showed that exports are positively impacted by innovation. The importance of technology in Norwegian exports also revealed that technical innovation has a favourable effect on the exports of Norwegian businesses (Zhang et al., 2022). According to Okręglicka et al. (2023), a beneficial association between innovation, technology, and exports is supported by much research in addition to those mentioned above. For instance, research on the effect of intellectual property rights (IPRs) on exports in developing nations discovered that strong IPRs can encourage innovation and knowledge transfer, which can be advantageous for the exports of the nation. The correlation between innovation and productivity in European businesses demonstrates that innovation boosts output, improves firm competitiveness, and boosts exports (Zhang et al., 2022). Additionally, the relationship between productivity and Belgian companies' engagement in export markets demonstrates that companies with better productivity are more likely to do so, indicating that innovations that boost productivity may have this relationship. It implies that there is a chance to raise the likelihood. Similar results were found in Spanish companies, where it was found that

innovative companies were more likely to engage in internationalization activities, such as exports (Zhang et al., 2022).

The influence of innovation and technology on exports may affect both manufacturing and services, which is another crucial point to remember. For instance, the correlation between digital innovation and service exports demonstrates that digital innovation benefits the exports of Italian service companies (Zhang et al., 2022). As proposed by Dzwigol et al. (2023) the influence of government policy and regulation in the impact of innovation and technology on exports is another crucial factor. Governments have a significant impact on the atmosphere that fosters innovation and the uptake of technologies that can increase a nation's export competitiveness. Examples of policies that can encourage firms to innovate and create new technologies include those that promote financial assistance for enterprises, stimulate investment in research and development, and safeguard intellectual property rights. Furthermore, laws that make it easier to transfer technology and information across national boundaries may benefit a nation's export performance.

In research on the influence of government policies in fostering innovation and exports of developing nations, Yan et al. (2018), discovered that policies that support technology transfer and encourage research and develeopmet can have a favourable effect on a nation's export performance. The study on the effect of trade agreements in encouraging innovation and technology transfer also revealed that trade agreements can assist to remove barriers to the transfer of technology and knowledge across borders, which can have a favourable influence on a country's export competitiveness (Martínez-Zarzoso & Chelala, 2021).

According to Galván-Vela et al. (2023), government regulations are not the only factor that may affect how innovation, technology, and exports are related. Company-level variables like company size and ownership structure can also have an influence. For instance, research on the effect of innovation on the export performance of Korean small and medium-sized businesses (SMEs) indicated that innovation has a favourable impact on SMEs' export performance. Additionally, it was shown that family-owned businesses are less likely to engage in innovation activities and had lower export intensity than non-family-owned businesses when examining the link between innovation and exports of Indian manufacturing enterprises (Galván-Vela et al., 2023).

As stated by Nassani et al. (2023), furthermore, a firm's export competitiveness may be impacted by the adoption of new technology, such as digital technologies. Digital technology may help businesses cut expenses, expand consumer interaction, and improve manufacturing processes, all of which can help them become more competitive abroad. Additionally, it was

discovered that digitization has a favourable impact on a firm's export performance when looking at how it affects African enterprises.

Additionally, adopting sustainable technology like clean energy ones might enhance a company's export competitiveness. Sustainable technology may aid businesses in lessening their environmental impact and supplying the expanding market for sustainable goods and services, which can improve their ability to compete internationally. According to research by Auer (2022), on how clean energy technology affects German companies' export competitiveness, a firm's export competitiveness is positively impacted using clean energy technology.

It's also important to remember that different industries might see different effects of innovation and technology on exports. For instance, research by Yang et al. (2022), on the effect of innovation on the export performance of Swedish enterprises discovered that high-tech sectors are more impacted by innovation than low-tech ones. Furthermore, Qi et al. (2019) study on the influence of innovation on Chinese enterprises' exports discovered that innovation had a higher effect on the export performance of technology-intensive sectors than non-technology-intensive industries.

In conclusion, innovation and technology may be extremely important in boosting exports and reducing a nation's economic imbalance. By raising the quality of goods and services, lowering production costs, and boosting production efficiency, a strong technical infrastructure may increase exports' competitiveness (Gaasland et al., 2020). Additionally, innovation may provide businesses a competitive edge by enabling them to manufacture top-notch goods and services for less money and to develop new goods and services that can open new market prospects and boost demand for a nation's exports.

There are certain opposing factors to consider, even while innovation and technology adoption have unquestionably contributed significantly to improving the export competitiveness of enterprises with roots in Norway (Martínez-Zarzoso & Chelala, 2021). For instance, contend that emphasising innovation and technology adoption too much may cause one to overlook other crucial elements that might have an impact on export success, such as market access, trade regulations, and exchange rates.

Additionally, others contend that innovation and the uptake of technology can produce economic winners and losers, resulting in inequality and societal problems. For instance, some would claim that the high level of technology development in sectors like marine and oil and gas may result in employment losses in conventional industries and less technologically sophisticated locations. Uneven wealth and opportunity distribution may come from this,

which may have social and political repercussions (Dabla-Norris et al., 2015). Furthermore, there is a chance that too much reliance on a small number of crucial sectors or businesses would result in susceptibility and exposure to outside shocks. For instance, Norway's economy is very reliant on the oil and gas sector, which has seen a lot of volatility in recent years because of things like shifting global demand, geopolitical unrest, and environmental worries (A. Khan & Qureshi, 2022). Despite using technology and innovation, Norway-based businesses in the sector nevertheless run the danger of being exposed to outside shocks that might have a large negative influence on the nation's (ITA, 2022). Additionally, there is a chance that technological development will have a detrimental influence on the environment, which might harm the nation's standing and export competitiveness. For instance, the oil and gas sector are frequently criticised for its detrimental effects on the environment, such as greenhouse gas emissions and oil spills, which can harm its reputation and reduce the demand for Norwegian oil and gas goods on the international market (A. Khan & Qureshi, 2022).

Despite these opposing arguments, it's crucial to remember that innovation and the adoption of new technologies may also have favourable spill over effects on other businesses and geographical areas, resulting in broader economic growth and job creation (A. Lewandowska & Cherniaiev, 2022; M. S. Lewandowska et al., 2022). Governments and businesses may also take action to alleviate some of the negative effects of technology breakthroughs by supporting sustainable practises and technologies and investing in education and training programmes for workers in traditional sectors. Although innovation and technology adoption have significantly improved export competitiveness of Norway-based companies, there are also some negative aspects to consider, such as the risk of ignoring other significant factors that can affect export performance, the risk of creating winners and losers within the economy, over-reliance on a few key industries or companies, and negative environmental effects. Striking a balance between innovation and technology adoption is crucial, as are other significant elements that might have an impact on export success. Action must also be taken to counteract the unfavourable effects of technological breakthroughs.

According to Taherdoost & Madanchian (2023), the technology innovation is considered as one of the most efficient factors for the growth of the business organization. It can be stated that technological innovation has been leading for the productivity as well as efficiency in the business growth. Also, by boosting the exports, the countries can decrease deficit in the economy of the business as well as the income from the exports of the business. It is necessary for the business organization to make effective planning and strategies for the growth of the business. This assists the business organization to boost the ability to export the products. As

stated by Lausselet et al. (2023), it has been observed that the organizations of Norwegian have been developing their business by making efficient use of technologies. Also, Norway business have started to produce goods and services, with better quality products with effective cost price. Norwegian companies have been able to increase the quality of their products through innovation and technology. This has made their products more appealing to overseas buyers, resulting in increasing exports. Norwegian manufacturers have been able to produce new products with distinctive qualities, making them more appealing to foreign markets. This has allowed these companies to diversify their export offerings, minimizing their reliance on a single product or market. As proposed by Kekkonen et al. (2023), Norway companies that invested in technology and innovation increased their efficiency, resulting in increased production and competitiveness. As a result, these companies were able to boost their exports and create more income. Innovation and technology have enabled Norwegian businesses to create new and unique items, allowing them to boost their exports. These innovative items have been able to enter new markets and grow their market share. Innovation and technology have enabled Norwegian enterprises to embrace sustainable practices, which has become increasingly important to foreign clients. These sustainable practices have assisted these businesses in differentiating themselves from their competition and increasing their exports. As it has been observed that the value of the production of the products and services are high and is boosting in the productivity of the economy. It has been noticed that the value of the production of goods and trades are increased and reach a peak.

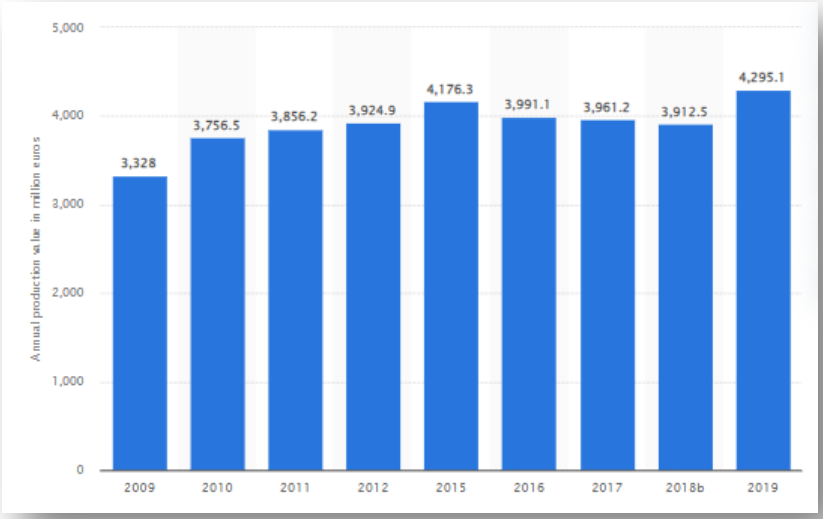

Figure 1 : Annual production value of the high-technology manufacturing industry in Norway from 2009 to 2019

(Source: statista.com, 2023)

As proposed by Lybæk & Hauggaard-Nielsen (2023), Norwegian enterprises who engaged in technology and innovation were able to improve the quality of their products, allowing them to expand their exports. This has proved especially essential in areas like fisheries, where product quality is critical for worldwide clients. Innovation can enable a country to create new products that are distinct from those supplied by competitors. This can assist the country gain a competitive advantage and improve demand for its products in foreign markets, ultimately leading to an increase in trade volumes. As stated by Abdullah et al. (2023), firms can benefit from increased productivity and efficiency, which can lower costs and make them more competitive in international markets. This may result in greater exports and trade volumes for the country. Innovation within the business organization is an essential factor that can be considered by a firm. Understanding needs and requirements are the important aspects of a business organization. In increasing technological development, many business organizations have developed and innovated products and services by upgrading to the technological change. It has been easy for the business organizations for exporting their goods and products through the digitalization process. Also, it has become easy for the business organization to make easy management of the supply of the products and services. Connecting to the other business and the country becomes easy for the business organizations while import and export of goods and services.

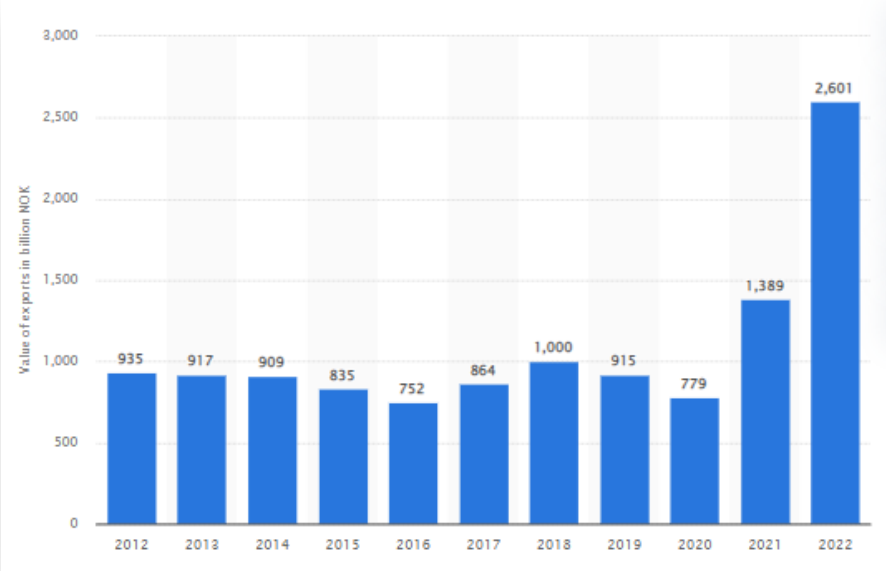

Figure 2*:* Value of exported goods from Norway from 2012 to 2022
(Source: statista.com, 2023)

According to Moghrabi et al. (2023), digital technology and e-commerce enable businesses to contact customers in markets that were previously inaccessible owing to geographical limitations. This can lead to enhanced export potential as enterprises can enter new markets and grow their consumer base. Geographic obstacles and distance sometimes limited organizations' reach in conventional business models, making it difficult for them to develop their consumer base beyond their immediate environs. However, the advent of digital technologies and e-commerce has altered this scenario. As stated by Annoni et al. (2023), with the introduction of the internet and other digital technologies, businesses may now exploit digital platforms and e-commerce channels to reach clients in previously inaccessible markets, including those located in various regions and nations. Businesses can also adjust their marketing strategy and product offers to specific markets using digital technology and e-commerce platforms. For example, a corporation can utilize social media channels to reach clients in specific locations, advertise its products in local languages, and modify its product offers to match the requirements and tastes of customers in different regions. This can assist organizations in developing strong client relationships and increasing their export potential by cultivating a loyal customer base in new markets. Furthermore, e-commerce platforms offer businesses a low-cost way to reach customers in international markets. Businesses, for example, can avoid the overhead expenditures associated with traditional brick-and-mortar

operations, such as rent, utilities, and maintenance, by operating purely online. This enables businesses to offer competitive prices to customers in international marketplaces, making their products more appealing and improving their export potential.

2.6. Innovation in processes for improved trade practices

Gaasland et al. (2020) & Straume et al. (2020), represented that the foodstuff with the highest international commerce is seafood. Fisheries have recently played a bigger role in the supply of seafood, permitting expanded commerce in Norway. Although there is an indication that fishers can much more prime task marketplaces and move the fisheries through much more productive logistic chains. In Norway, because of the greater level of manufacturing control engineering, much emphasis has already been paid to the possibility of how this could potentially affect trading strategies. The second largest fisheries steakhouses exporter within the globe, Norway, seems to be the subject of the study, which examines whether trade profits for farmed goods vary from trading in natural fisheries items across various margins of commerce in addition to overall export earnings. And over 36% of marine output is marketed, making it the largest tradable foodstuff category globally. As a result, a sizable portion of the fisheries output is accessible to global commerce opening the way for increased seafood export in Norway. Global fish commerce has significantly increased over the last decades as a result of technical advancements, improvements in distribution chain operations, as well as a significant increase in fish farming output. Most of the increase in global fisheries supplies has led to more innovation in its processes. It has increased knowledge sharing and developed innovative ways in the supply chain as well as logistics. Additional variables, like travel expenses such as per delivery prices, have a greater impact on fish farming goods than aquatic products (Ellis & Tiller, 2019), It results in the optimisation of processes emphasizing another area wherein manufacturing processes management may be employed to compete within the global markets. Well-designed control processes in production assist to add innovation in aquaculture that facilitates the supply chain along with easy access to new markets. In Norway, focusing on unit price along with the size and margin number of shipments has assisted to increase its seafood exports.

Whereas, based on the perspective of Capasso & Klitkou (2020), the term "bioeconomy" has become more commonly used to describe the segment of the business that relies upon the production of biofuel. Current practical examinations of something like bioeconomic within the European Union had already embraced a term meaning of the term "bioeconomy" which includes operations in hybrid industries. The inputs for such segments comprise both bioenergy

and a significant portion of many other substances. The characteristics and development of a low-carbon economic system in Norway were evaluated by authors who employed a similar concept. Both concerning a sector makeup of a business as well as the pace of technical advancement, its Norwegian green financial system is complicated. Their investigation, which seeks to identify Norway's unique characteristics regarding bioenergy utilization, is based on the country's information concerning value addition & jobs in addition to interviews conducted. The efficiency of the Norwegian low-carbon economic system has significantly grown through technological innovation, lowering its economic deficit (Steen & Hansen, 2020). Fisheries and farming, which currently offered high trade, have significantly increased. While at the identical moment, the pharmacy industry is going through a significant transition towards bio-based manufacturing, leading to more innovation in its production to logistics systems. Therefore, broad patterns within the nation's green economy have indeed been generated by various transformational processes throughout industries. A comprehensive examination of a concept of a green economy as well as its consequences for economical quantitative research is produced by the empirical investigation that has led to sustainable development in Norway.

3. Research Methodology

3.1. Overview of chapter

This chapter will be covering the methods that will be followed for the completion of the research and generate key findings that have been considered for the entire thesis. For writing the research methodology Saunders Research Onion has been used. The framework has covered the research philosophy, approach, choice, strategy, time horizon of the research and the ways used for collecting and analysing the data.

3.2. Research Philosophy

As per the views presented by Alturki (2021), philosophy can be defined as the set of beliefs that are followed for the completion of the research. It is influenced by the reality of existing knowledge in the current area of the topic which is being searched. This is because of the reason that all the information regarding innovation of the technology is impacting the exports which are going on in the country and managing the level of information about the key issues regarding the management of the developing a new option and including the decision during the process. This is the reason that this philosophy has been selected for the completion of the research.

Other philosophies such as interpretivism and pragmatism are not selected. Interpretivism can be defined as how knowledge is being interpreted this form of knowledge is already existing in nature. According to the views presented by Pandey & Pandey (2015), interpretivism is not being selected as the data that is existing about the information regarding the ways innovation is impacting exports of the country has been considered and the ideology behind the topic is not important to be studied in the context of the current area of concern.

As per the views presented by Alturki (2021), pragmatism philosophy is described as one of the best tools that is aiding in managing the level of possible phenomena. The main aim of this research philosophy is to provide a practical point of view. This is because knowledge is not existing in nature. Pragmatism is not important for the completion of the research as no new practical approaches have been provided and the point participants have been involved in the duration for gathering the responses regarding the management of the decision of the participants. No new practical approach is used for finding whether the key information has been regarded for understanding the level of problems that have been associated with the impact that has been observed for the ways innovation has impacted the exports of Norway-based firms.

3.3. Research Approach

It can be defined as the broader approach that has been described for completion of the research. The approach can be described as an inductive and deductive approach. As per the views presented by Pandey & Pandey (2015), this research approach which has been followed in the research is the deductive approach. It is important for the management for focusing on the necessary outcomes and testing the theory that has been developed during the research. This is because there has been an already established theory that innovation has created an impact on the exports of the country. However, the theory is being put to a test whether it is the same for all the scenarios and firms that are working in Norway-based companies.

The inductive approach has not been deemed appropriate for completion of the research. According to the views presented by Dalati (2021), the inductive approach can be defined as the approach that is linked with the designing of the theory that has been tested during the key elements of the research as no new theory has been collected during the process and making sure that the concerns are managed properly without any problems. It is important for understanding the key elements which have been discussed during the key theories that have been generated during the process of the research. As no new theory has been derived for understanding the impact that was created the focus has been shifted to the current aspect and regarding the management process of building and testing the procedures for the research.

3.4. Research Strategy

Research choice can be defined as the conceptual and intangible aspects that are required for the completion of the research. It is important for peeling the concerns and managing the level of problems for identifying the key strategies that are needed to be implemented for the completion of the research. According to the views presented by Zawacki-Richter et al. (n.d.), this research has followed a case study strategy, this is because of the reason that the key elements that have been discussed during the element will be focusing on understanding the research strategy and topics that are related to the management process. Engaging in providing the necessary outcomes through studying the various factors that are impacting the Norway-based companies and focusing on enhancing the level of management in the current business. The business needs to focus on enhancing the level of management and key elements that are linked to managing the key information regarding an understanding of the Norway-based companies.

Other choices like experimental, archival, grounded theory and ethnography were not selected for the completion of the research. Experimental research is based on manipulating the research

and focusing on observing the changes that are focused on assessing the relationship among the people and the key elements. This is due to the reason that all the necessary elements have not been considered for the completion of the research as there is no new theory that has been generated during the key elements for the completion of the research. This is the reason that experimental research has not been selected in this process. The research needs to follow all the key concepts and address the changes that have been observed during the key factors that have impacted the culture which is impacted during the process.

As per the views presented by Kothari (2017), archival research is a form of research that is research that is focusing on the key elements that are being addressed during the situations for drawing the material that is already has been established during the process. None of the data that has been generated during the key issues regarding the management of the information has been considered for the completion of the research. This is the reason that the company needs to consider all the necessary elements regarding the management of records at the time. This is the reason the archival research was not selected for the completion of this research.

Grounded theory can be defined as a strategy that is implemented for the completion of the research. The data that has been generated for informing the development of a new theory and letting data inform the development process. According to the views presented by Snyder (2019), grounded theory is the key element that is working on collecting the data through the use of a qualitative manner and forming to take an inductive approach for the completion of the research.

3.5. Research Choice

The choice of research can be defined as the various methods that shall be used for the completion of the research. This research has followed the mono-method. It means that the data that has been generated for the completion of the research has only followed one form of study for the specific area of research. According to the views presented by Alim Hafidz et al. (2021), this choice has been selected for the completion of research the reason that quantitative form data is because of the reason that the key consideration needs to be considered as the data was collected through the form of a survey. It is the reason that the data has been collected through this form of research and following this can allow for investigating the key information and managing the level of views and opinions that has been decided by the individuals.

Other choices like mixed and multi-method have not been selected for the completion of the research. According to the views presented by Patel & Patel (2019), multi-method can be defined as the data collection form this will be allowing the researcher to generate the data

regarding the generation of the information and use more than one qualitative and quantitative approach for the research. This is the reason multi-method has not been selected for the completion of the research. The mixed method can be defined as the form of research regarding the management for completion of the key elements for reducing problems regarding constraints of the research. No more than collection of the data has been considered from various sources as the data was only generated through the form of samples and various secondary sources. This is the reason mixed method was not adopted as entire data is in concern with a gathering of data regarding the quantitative form of data.

3.6. Time Horizon

The time horizon is defined as the time that shall be utilised in the completion of entire research process and considering the key elements the individuals need to complete the necessary data collection process during the stipulated time. According to the concepts described by Rumsey et al. (2022), the time horizon that has been selected for completion of the research is cross-sectional. The data is generated during this form of research is based on a specific period. It is considered important for achieving a better understanding regarding the management of the key information that has been generated during the process and making sure that the data has been generated in the completion of the research.

As per the views presented by Alturki (2021), a longitudinal time horizon can be defined as the information taken into consideration for the completion of the entire research process. Longitudinal research is important for understanding all the necessary information regarding managing the level of data generated through the completion of the research. A longitudinal time horizon is not deemed appropriate for completion of the research and managing the level of information regarding the management of information. This is due to the reason that the research needs to be submitted before the deadline this is the reason it is important for focusing on addressing the issues that can be faced during the completion of work.

3.7. Data collection and analysis

As per the views presented by Ryder et al. (2020), data collection can be defined as how the data shall be collected during the process and managing the use of data for completion of the research. The data has been collected using the survey that is collected from a population size of 100.

The collection of data also included various secondary sources. The data that has been collected using the second form of data which is generated through various journal articles and books.

This can enhance the level of information that has been generated through this form of data generation and forming a better idea for understanding the latest information and unlocking a better idea for the completion of the research.

As per the views presented by Alturki (2021), data analysis can be defined as the procedure that is adopted for analysing the key findings that have been generated from the results of survey and various secondary sources. When constructing the analysis of the data descriptive analysis has been used. Descriptive analysis can be defined as the process of using current and historical data for identifying trends and relationships for the management process. This is because most of the data is utilised in forming a proper conclusion about whether the analysis can impact the overall performance of the management and forming better outcomes for the results that have been generated for identifying whether the innovation is creating a major influence on the exports based on the firms that are situated in Norway.

Other analysis techniques like prescriptive, diagnostic, and predictive are the ones that are not deemed appropriate. Prescriptive analysis is defined as the process of using the data and determining the most optimal aspects of showing the entire decision-making process. In this the concepts that are regarding the concerns that have been implemented during the process and management of the information and reducing the problems which are faced when assessing the key elements of exports and problems faced in the innovation this is the reason this analysis technique is not to be appropriate for the implementation of the decision options.

Predictive analysis can be described as the variety of analytical tools that are used for predicting the future elements of the key results that have been generated in the process. Predictive analysis is deemed to be inappropriate for the completion of the research as the outcomes that have been generated for completion of the research. In this no prediction is established during the key element and focusing on this can lead to the management of key resources and regarding the level of assessment that has been generated during the process of performing a better element and generating a higher level of knowledge. The research is not focusing on generating any new form of findings that is relating to an understanding of future data. This is the reason this form of analysis is not considered to be appropriate for the completion of the research.

Diagnostic analysis is defined as advanced analytics that is examining the data and content for analysing the key elements in which the information has been impacted during the process. It is related to data mining and creating a correlation with the management of the discovery of the information. This is because of the reason that no major data and analyses are addressing

the issues for understanding the ways innovation is impacting the level of exports in Norway-based firms.

3.8. Data

Data has been acquired from primary and secondary sources of data as the survey was done for collecting primary data from questionnaires and the target to achieve is 100 responses from the respondents that belong to people of Norway. Secondary data is collected from journals, research articles and through magazines and from a database that is from Google Scholar and the articles that fall under the category of reviewed articles of different authors. The populations of Norway are examined for the researchers who are working, and random sampling is done in the research for Norway, as random samples are taken from the people of Norway. The criteria for inclusion in the sample are the important features of the population that are required for answering the research question. An inclusion criterion is used in the research as it includes geographical characteristics. Inclusive criteria have the elements of the related topic if they are to be included in the study.

The sample size had inclusive of the population that are belonging to the student who come in exchange programme from different countries during the 6-months programme of Norway. Along with this other student in the University and Facebook friends had also participated in the survey where they have been asked to share their opinion regarded their future organisation's strategy related to export. The data is collected using random sampling by sharing Google link form over which questions were published. The survey size will help in gaining a clear insight about the people that are living in the Norway while all the information that is being analysed being present an easy accessibility of the information that can reduce the time that is taken for the conducting the research.

Data sets are the collection of data as it contains one or more records, it is organized into types of data structure. Data can be calculated through data mean by dividing the sum of values into the data set with the number of values and data is calculated by collecting the data by questionnaires. Age can be calculated as: (36+30+24+10)/ 4= 25. It specifies that majorly the respondents were belonging to an average age of 25 years. Literature reviews are read in which study is done by different authors, as they have a different point of view. The objective of the research is to understand the economic deficit that can be controlled by the building of technological infrastructure and identify how the country can achieve a competitive advantage that can influence the total trade volumes. The research aims to understand impact of

technology and innovation on the enhancement of the exports of the country in Norway based firms. The instrument that is used for the collection of data in the research is a questionnaire.

Various responses were gathered from respondents about the factors influencing the decisions concerning the export of their current organization, knowing if they agree on the view that innovation and technology provide help in enhancing exports in Norway, what the role of innovation-based firms in reducing the economic deficit of the country, how the geographical synergies for innovation help in increasing trade performance in Norway. Views were gathered to know whether value chain and innovation have an important role to increase trade performance in Norway and the impact of technology as well as innovation on the environmental conditions of Norway.

Questionnaires was considered an economical method for collecting information from the respondents residing in Norway. It involves a large group of persons at the same time and is also easy to plan (Ebert et al., 2018). Though the responses are collected at present, it helps in doing an in-depth study at later stages. Using questionnaires has several disadvantages also such as the respondents changing their earlier answers if they found that their views contradict the earlier answers, emotions of Norwegians cannot be noticed through it and some of the respondents' misinterpreting questions which created difficulty in analysing the responses.

4. Results and analysis

4.1. Overview

Innovation in different products and processes helps Norway to improve its economy by increasing exports to other countries. Clusters help to increase exports in Norway by developing new products. The economic deficit can decrease, and sustainable development can be achieved while meeting the overall findings for the research.

4.2. Results and analysis

The need for innovation has been increasing day by day in every field and every region to face the competition prevailing among the firms in the Norwegian region. The government of Norway supports technology and innovation in the firms. In this research, the positivism philosophy has been used as it is considered suitable per the current scenario where the exports in Norway are impacted by the information available for innovation of the technologies. A deductive approach has been followed in this research which is helpful to understand the important factors that have been discussed in the theories. The use of a case study research strategy is helpful in the research and the data used in the research is collected through a survey that has been collected from 100 respondents. The data has also been collected through primary and secondary research.

With the help of innovations, elasticity can be seen in competition and prices (Colclough et al., 2019). It is also important for achieving economic and social benefits for the different regions. It has been analysed that innovation-based firms provide a competitive advantage to the country in the market at the international level. This will lead to an increase in exports along with an increase in profits. Gas and oil resources have benefitted the Norwegian economy to a great extent thereby increasing private and public consumption (Cherepovitsyn et al., 2021).

The collaboration between the firms can be increased through research and development by gaining more knowledge which provides the path to develop a new product. As a result, the economic deficit can be controlled and exports among the different regions of Norway can be increased as the innovation-based firms help in minimizing the deficit of the country by having a competitive advantage for the country in the international markets and helps in strengthening the financial system of the country (IBM, 2023). The changes in new technology and its adoption will be beneficial for the firms in Norway to increase their ability of the firm (Zhang et al., 2022). In Norway, the scope of international trade can be known through the balance that has been developed between the availability of capital and the expected capital budget.

The results showcased that the cost of the products is not high that is allowing the companies that are operating in the Norway to gain competitive advantage (Biber-Freudenberger et al., 2018). Through the analysis of the finding, it can be found that the cash flow of the business is being impacted majorly for the Norway based companies as this is allowing in increasing the efficiency. So, it has been analysed that an increase in demand as well as the exchange rate will help the companies to increase their exports and will also provide help to the companies to add innovations in the process and products.

The fastest-growing food production technology in the world is aquaculture production (Cherepovitsyn et al., 2021). It has also been analysed that the efficiency of the business can be increased through the supply chain and innovation which helps to increase trade performance. Through the value chain, profits can be increased by developing an innovative product that becomes preferable to others (Ortigueira-Sánchez et al., 2022). Outsourcing the products at the international level helps to increase trade by exporting and importing products. It has been analysed that while making products the role of innovation is gaining importance as it helps in the reduction of wastage thereby enhancing exports.

One thing that matters in the export which has been identified is that the business is in the need to establish a clear goal for the corporations. These are the ones that are allowing in gaining proper competitive advantage. Through these the business can focus on building sustainable growth for the business and implementing the change process. The economy of the country can have the advantages of sustainable growth, and which is dependent on three main factors such as rise in labour inputs, advancement in technology and assembling capital stock. Innovation is important for economic integration as well as for promoting trade at the global level thereby achieving competitive advantages (Rehman et al., 2020). Innovation helps to build a more competitive economy and address different challenges concerning unemployment, sustainability of the environment and reducing poverty. It has been analysed that innovation and technology have a positive impact on the environmental conditions of Norway. There has been a good innovation system in Norway in the seafood sector where research and development institutions receive more funds (Bergesen & Tveterås, 2019). The economic deficit can be controlled when there are fewer barriers to entering the market which helps to increase exports thereby helping the economy of Norway to maintain a balance among innovative products and processes.

There is the increase in supplies of fisheries that led to innovation in the process which has increased knowledge (Bertheussen & Dreyer, 2019). The findings suggests that the unit price

margin is the ones that are allowing in building a clear culture for emphasising on building a trade culture. In Norway, companies are highly focused on purchasing the shipments of the seafood exports. This is hampering the quality of supply chain in the Norway based business industry.

5. Interpretation and Discussion

5.1. Overview of Chapter

This chapter will be discussing interpretation of the data that was generated using both primary and secondary data. When considering the data generated through primary analysis a survey was conducted from 100 participants and for considering the secondary data all the necessary journal articles and books were analysed on the topic.

5.2. Interpretation of Primary Research

Q 1: What is your age?

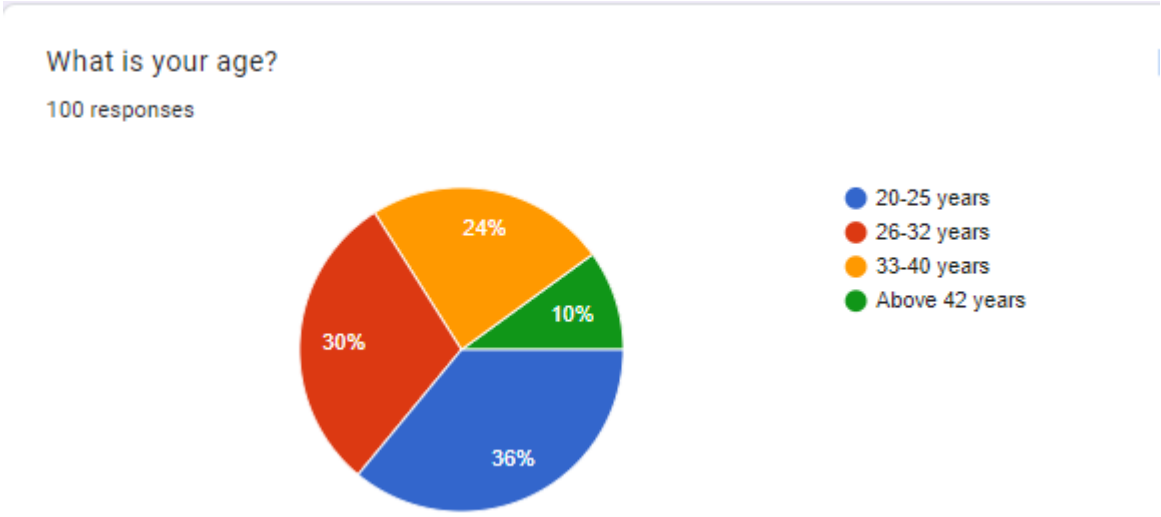

Figure 3: Age of respondents

It can be interpreted from the survey that a major part of the population belongs to the younger generations which is between the age group of 20-25 years comprises 36% followed by 30% of people whose ages between 26-32 years lie in the middle-aged category. On the other hand, there were 24% of the population belonged to the older generation which is between the age of 33-40 years whereas, 10% of the people involved were above the age of 42 years. Furthermore, the survey was collected on the random sampling basis from which the mentioned result has been generated. The reason people from the young and middle-aged generations are a major part of the survey is that they have more interest regarding the research topic, and these had more information on the export practices than people from other generations had. However, regarding the interest of the population about exporting activities has been observed from conversation with them.

Q 2: What is your gender?

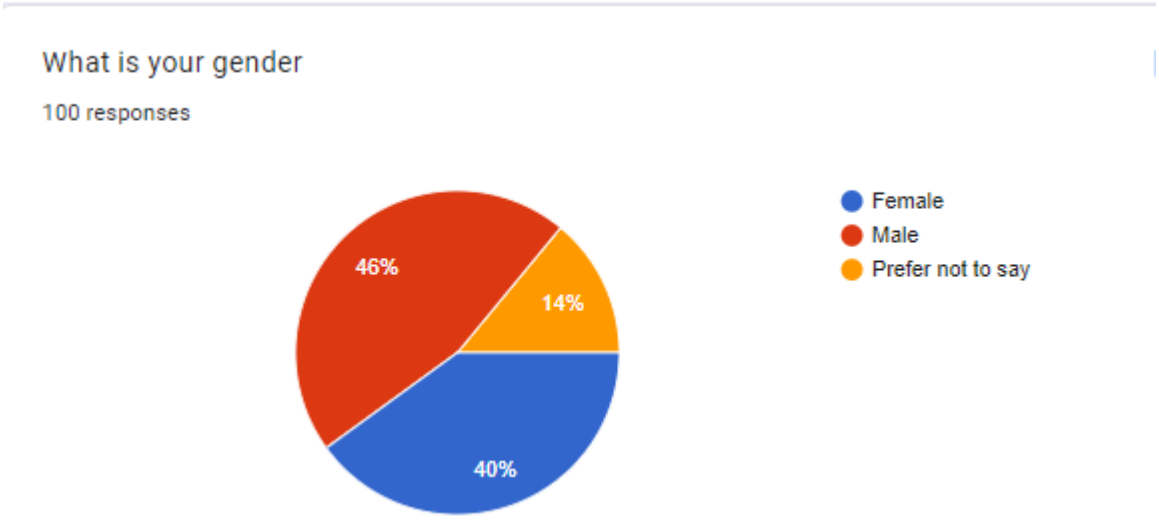

Figure 4: Gender of respondents

The survey interprets that most of the population involved were 46% out of the total population followed by 40% females while 14% of respondents preferred not to answer about their gender.

Q 3: Which industry do you work in?

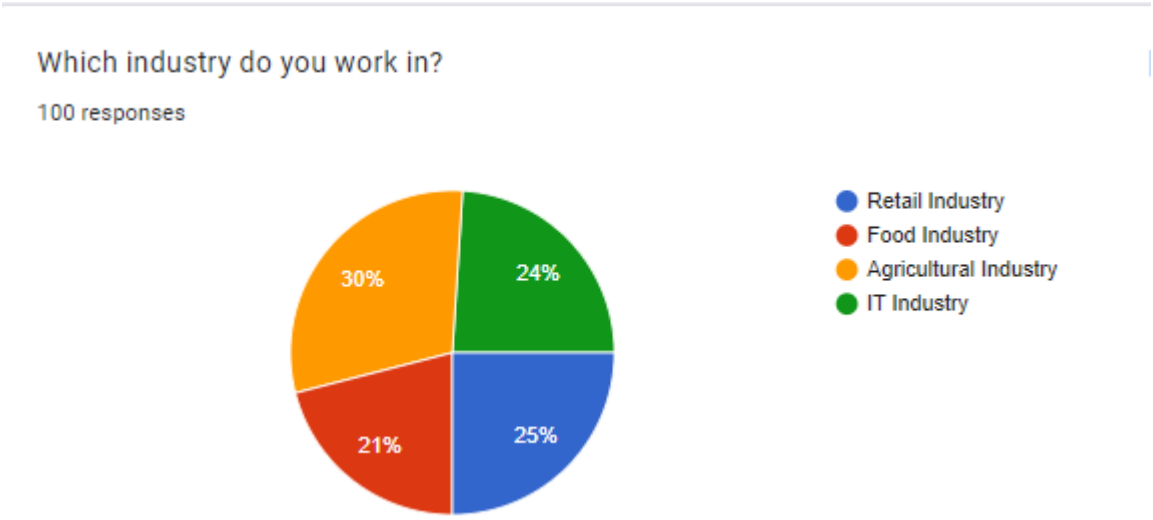

Figure 5: Industry in which respondents work

The question asked to the respondent was about the industry they are working where 30% of respondents who consist of most of the population work in the agricultural industry followed by 25% of the respondents working in the retail industry. On the other hand, 24% of the participants involved in the survey work in the IT industry whereas there are around 21% of the respondents work in the food industry. However, the survey was conducted in Norway from the students who came here during 6-months programme of Norway and the respondents belonging from these four industries comprise of a major section of the entire economy of Norway.

Q 4: What is the turnover of the organisation you are working in? (Approximate)

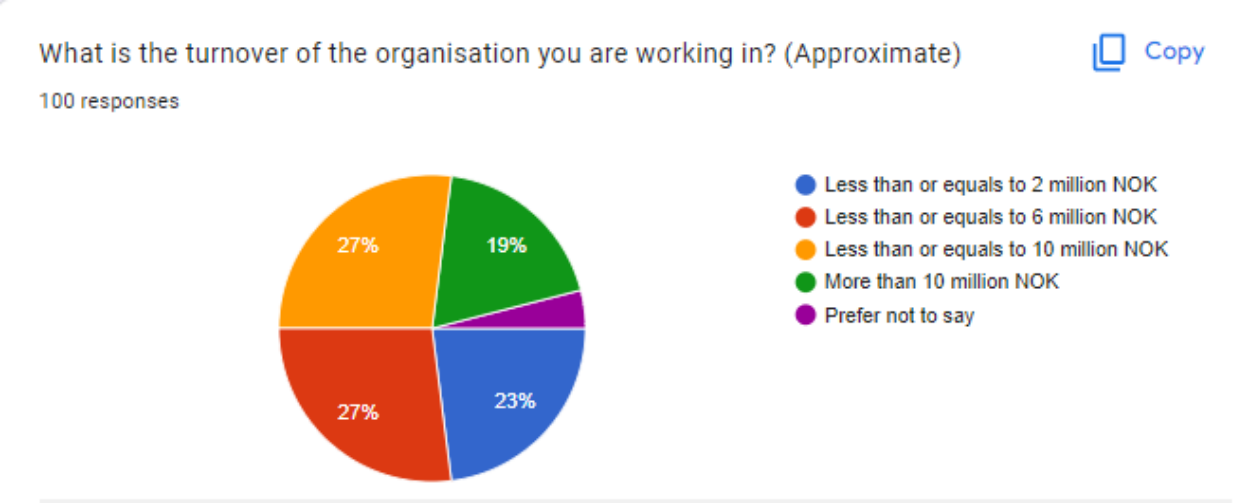

Figure 6: Turnover of respondents' organisation

As per the interpretation of the survey, there are 27% of the respondents according to whom the turnover of their organisation is less than or equal to 6 million NOK, 27% of the participants whose organisation turnover is less than or equal to 10 million NOK whereas, there were 19% of the respondents according to whom the turnover of their organisation is more than 10 million NOK. On the other hand, there was a section in the population comprising 4% of the respondents who preferred not to disclose the turnover of their organisation. Here, NOK is the currency of Norway known as the Norwegian Krone.

Q 5: How would you best describe your organisation as?

Figure 7: Nature of respondents' organisation

It can be interpreted from the survey that major part of the population that has participated in the survey which is 44% of the respondents have said that their organisation is capital intensive followed by 32% of the respondents who have said that the nature of the organisation they are working in is labour intensive. On the other hand, there are 24% of the respondents who makes up a significant part of the population who said that their organisation maintains a balance between labour-intensive as well as capital-intensive practices.

Q 6: Are you aware of the export operations of your organisation?

Figure 8: Respondents' awareness regarding the export operations in their respective organisation

The survey interprets that half of the population that is 50% respondents have said that yes, they are aware about the export operations in their respective organisation, on the other hand, there were 36% of the respondents in the population who have said that no, there not aware or do not know about the export operations in their organisation. Also, there was around 14% of the participants who were not sure that whether their organisation is operating in exports or not. The reason behind this can be the jobs they are performing in their respective organisation do not involve any export-related activities or other reason can be they are fresher and do not know much about all the operations in their organisation.

Q 7: How frequently your organisation involves in export activities?

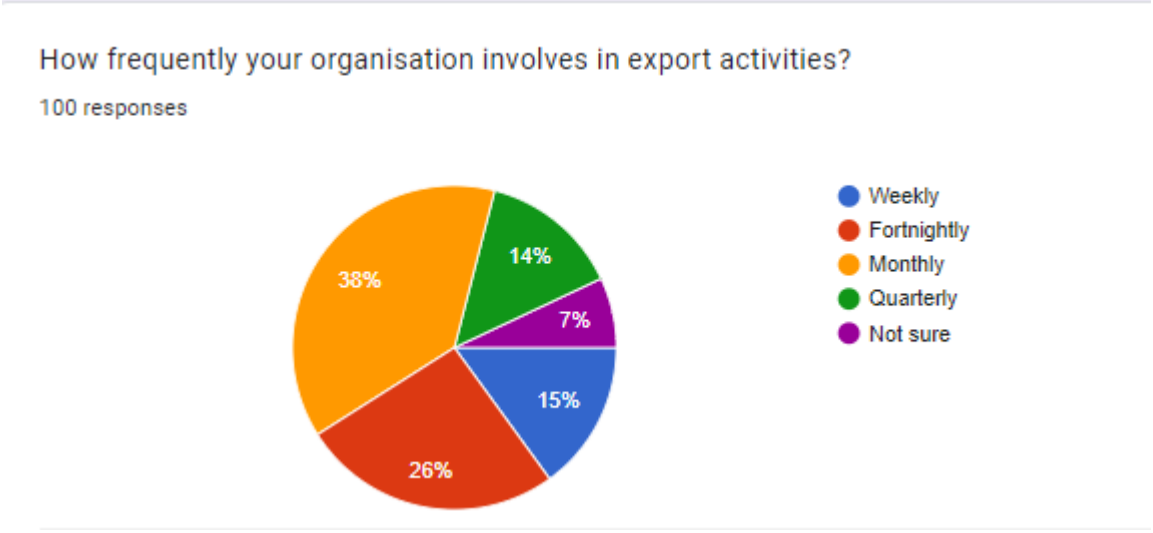

Figure 9: Frequency of export activities

The exporting activities in the organisation or firms mean movement of goods and services to other countries. It can be interpreted from the survey that there are 38% of the respondents have stated their respective organisation are involved in export activities on monthly basis followed by 26% of the respondents whose organisation are involved fortnightly in export activities and there are 15% of participants who involved in the survey have said that their organisation involved in the export activities on weekly basis. On the other hand, as per 14% of the respondents, their organisation involves quarterly in activities related to the export whereas there are 7 respondents who comprise 7% of the population who were not sure about the frequency in which their organisations are involved in export activities.

Q 8: What factors influence the decisions related to exporting in your organisation?

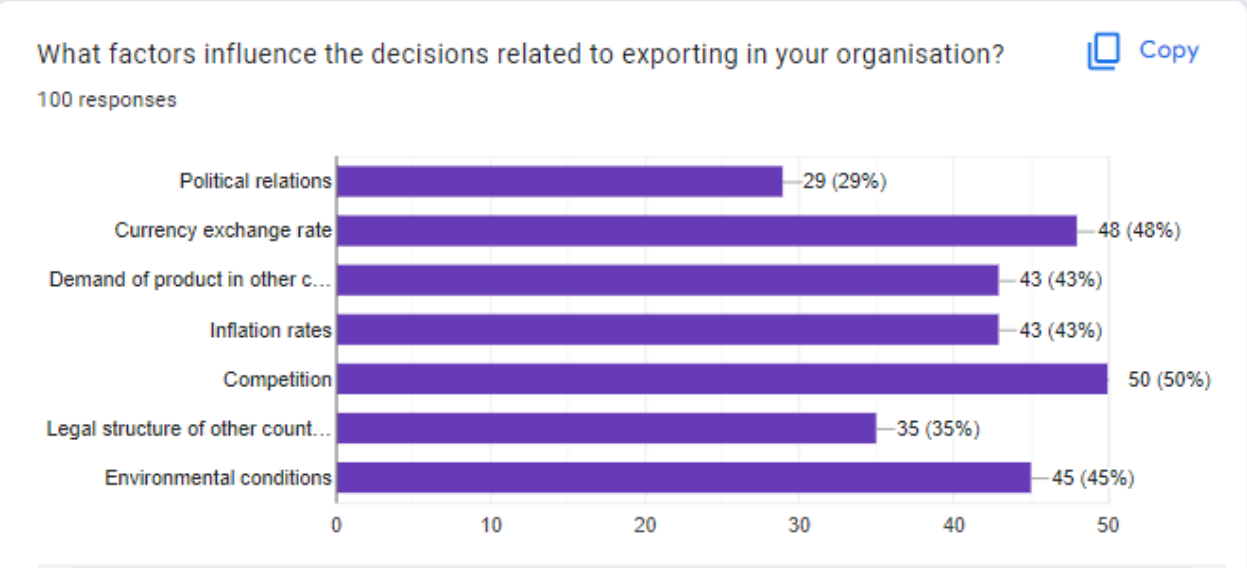

Figure 10: Factors influencing decision-making related to export

The next thing that has been asked in the survey is the factors influencing the decisions related to exporting in respondents' organisation where it can be interpreted that according to respondents, 50% of it is the competition that impacts the decisions related to exporting in the organisation followed by 48% currency exchange rate is the influential constraint, environment conditions as 45% impactful whereas 43% it is the inflation rate and same is the impact of demand of the product in other countries. It can also be seen that respondents have said that 35% of it is the legal structure of other countries which is an influential factor whereas 29% of the decisions related to exporting are dependent upon political relations.

Q 9: How much do you agree with the statement, “Use of innovation and technology helps in enhancing exports in Norway?

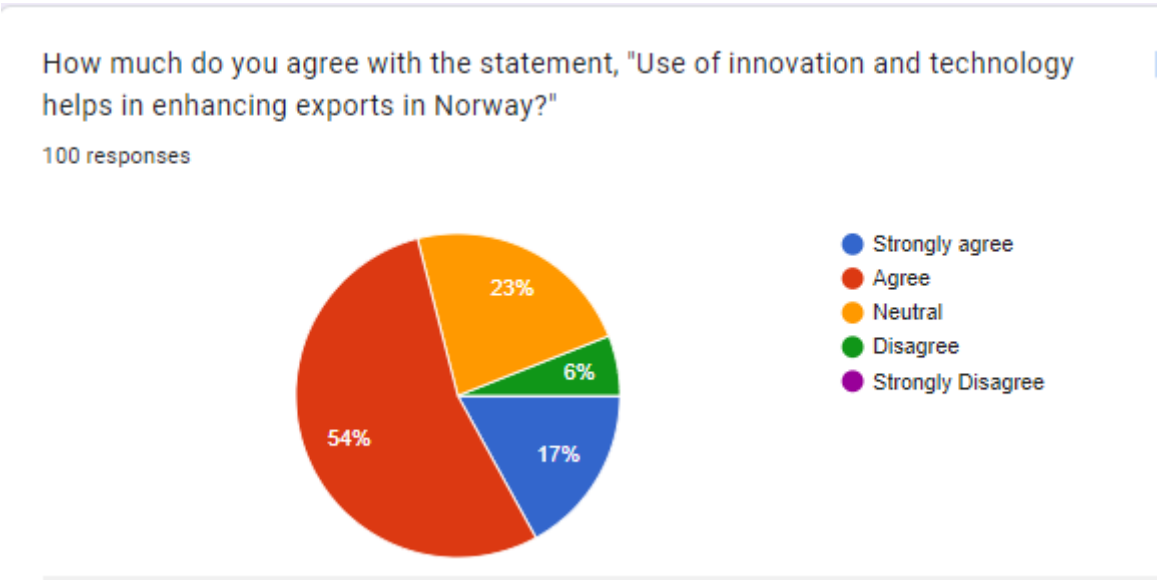

Figure 11: Opinions of respondents on the mentioned statement

The findings from the survey interpret that 54% of respondents agreed with the statement that using innovation and technology helps in enhancing exports in Norway followed by 17% who strongly agreed with it whereas there were 23% people on the neutral side who neither agreed nor disagreed. Also, there were only 6% of the participants disagreed with it.

Q 10: According to you, what is the role of innovation-based firms in reducing the economic deficit of the country?

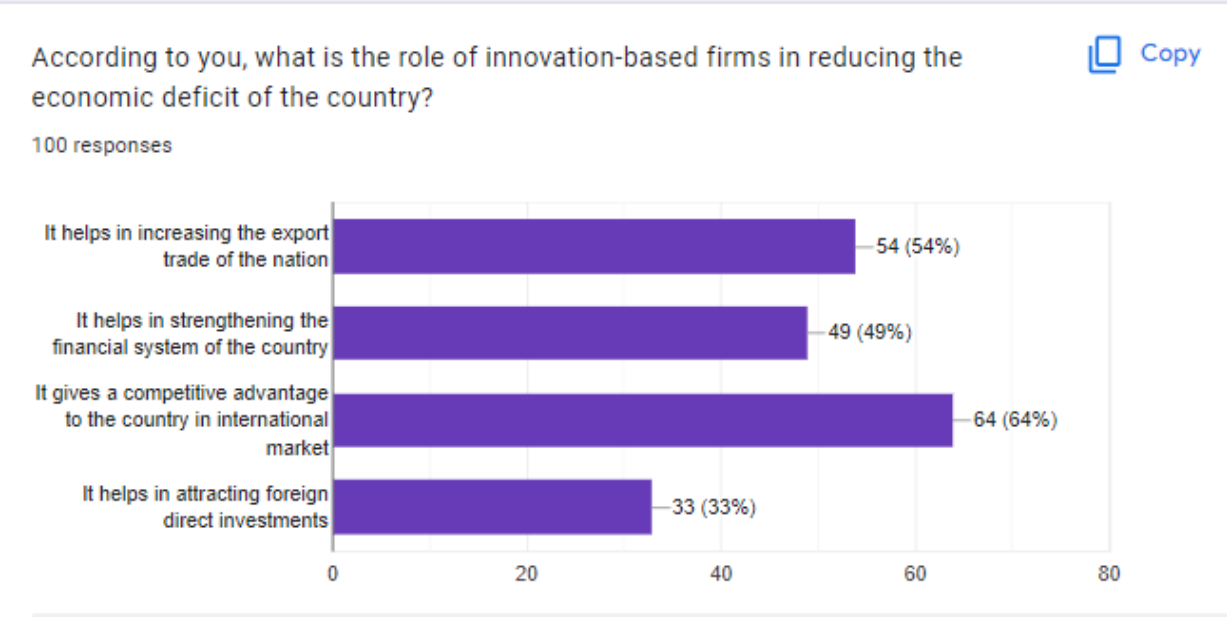

Figure 12: Role of innovation-based firms in reducing the economic deficit

This question is about the role of innovation-based firms in order to reduce the economic deficit and the mentioned mechanisms are being chosen because these help in making the economy of the country competitive as well as flourishing than other economies. It is interpreted from the survey that around 64% of the population believes that innovation-based firms give a competitive advantage to the country in the international market followed by 54% of those according to whom these firms help in increasing the export trade of the nation whereas there is 49% of the respondents have said that the innovation-based firms in order to reduce the economic deficit of the country play a significant role in strengthening the financial system of the country. On the other hand, there are 33% of the participants said that these help in attracting foreign direct investment in the country.

Q 11: Do you think the government of Norway supports innovation and technology in the firms?

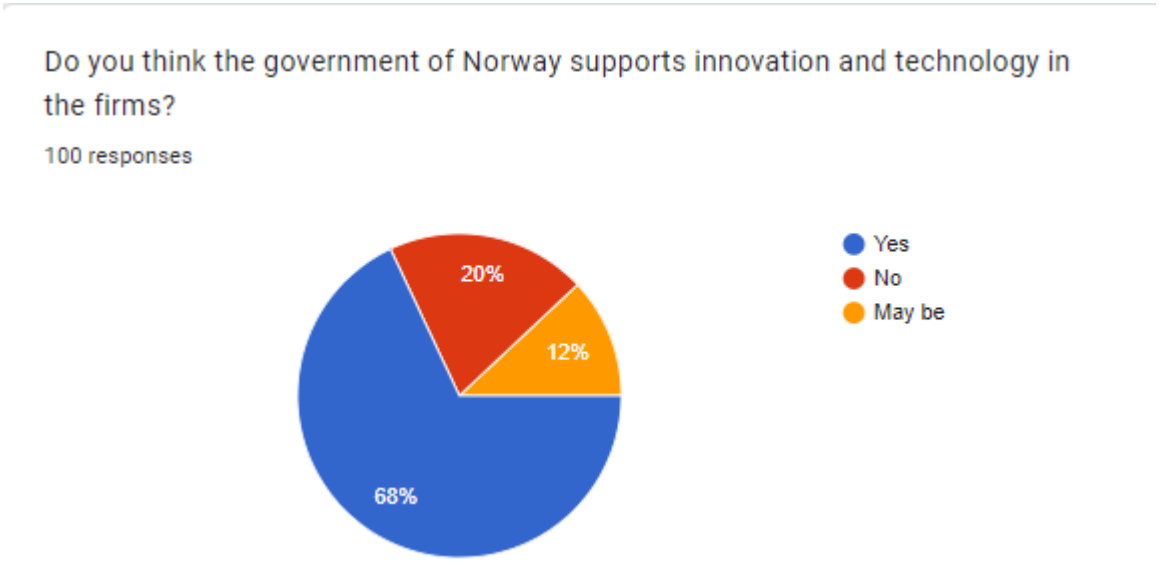

Figure 13: Opinions of respondents on the support of the Norwegian government in I and T in firms

The survey interprets that according to 66% of the population of the survey the government of Norway does support innovation and technology in the firms followed by 20% of the respondents who have said that no, the government does not support innovation & technology in the firms while 12% respondents were not clear.

Q 12: How do geographical synergies between the firms for innovation help in high trade performance in Norway?

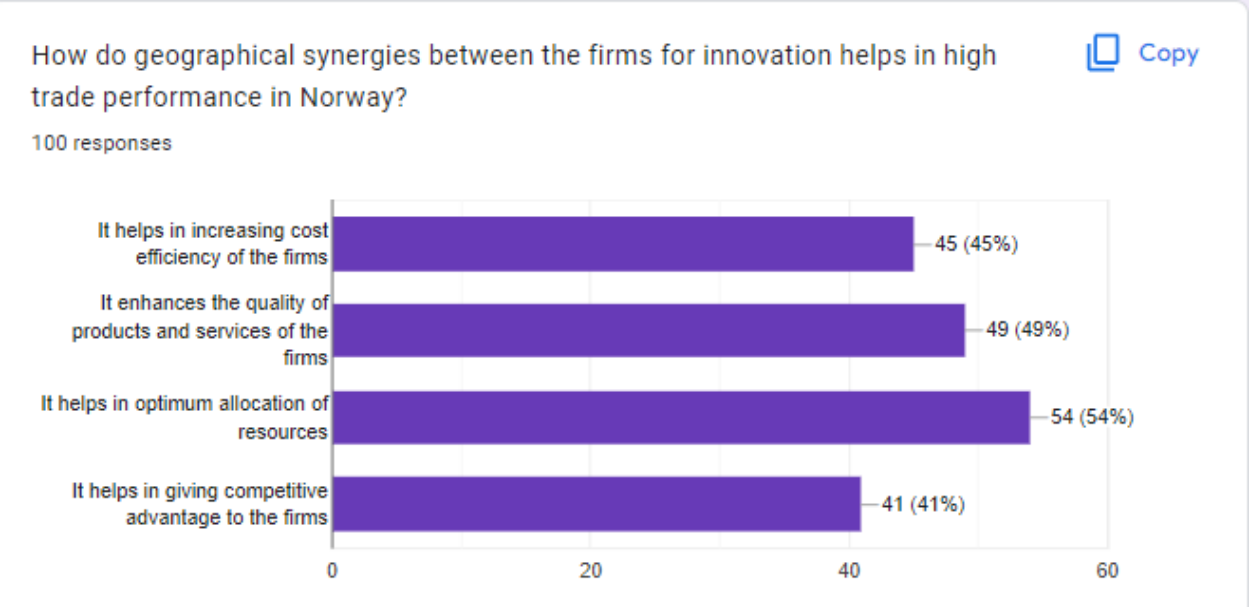

Figure 14: Geographical synergies helping in high trade performance in Norway

The respondents in the survey were asked about how the geographical synergies between the firms for innovation help in high trade performance in Norway. It can be interpreted that 54% of the respondents have said that it helps in the optimum allocation of resources followed by 49% of the participants who believe that global synergies enhance the quality of products & services of the firms whereas 45% of the respondents think that it helps in increasing the cost efficiency of the firms. There are 41% of those people according to whom global synergies help in giving a competitive advantage to the firms.

Q 13: How do the valuation and innovation of the firm help in managing the exchange rate changes?

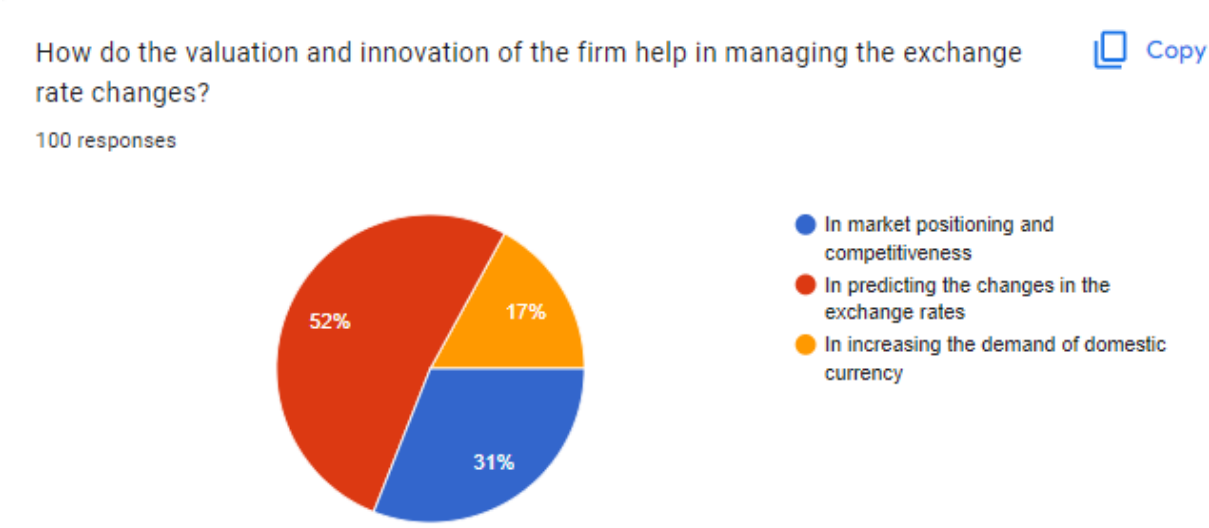

Figure 15: Valuation and innovation helping in managing exchange rate changes

The valuation and innovation of the organisation help it to manage export rate changes because it assists the organisation to create new markets, improving the old marketplace and looking for opportunities to enter entirely new industries. The survey interprets that the major constituent of the population comprising 52% of the respondents think that valuation and innovation help in predicting the changes in the exchange rates to efficiently manage it whereas 31% of the participants have said that it helps in market positioning as well as competitiveness followed by 17% respondents thinking that it helps in increasing the demand of domestic currency.

Q 14: How much do you agree that value chain and innovation play significant roles in increasing the trade performance of developed nations such as Norway?

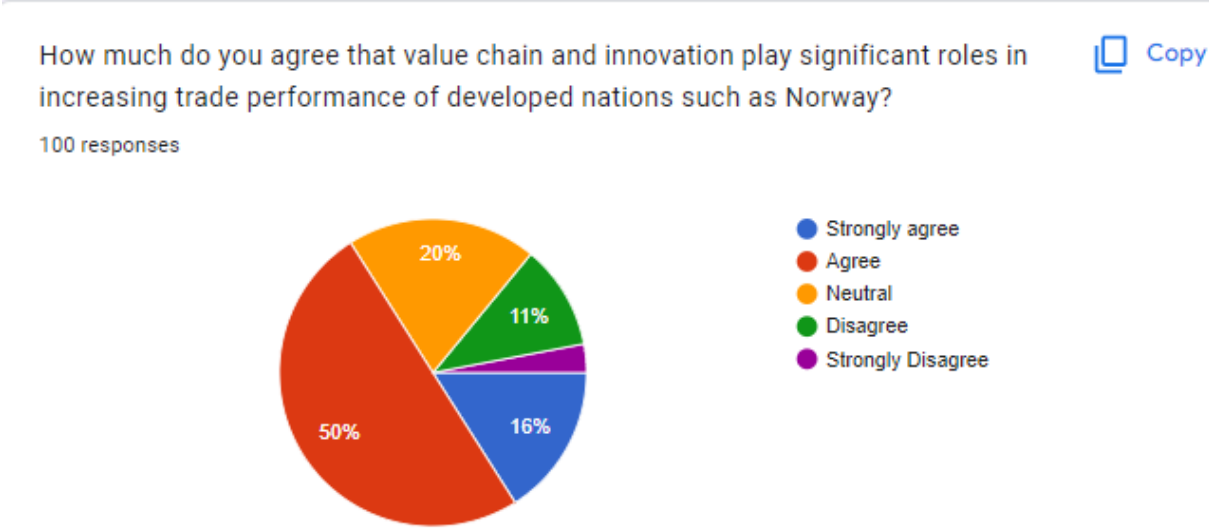

Figure 16: Opinions of respondents on the role played by value chain and innovation in increasing trade performance and exporting operations of Norway

It can be interpreted from the survey that when asked about the opinions on the statement whether value chain and innovation play significant roles in increasing the trade performance and exporting operations of developed nations such as Norway, it was found that 50% of the population agreed with the statement followed by 16% of the participants strongly agreed whereas 20% were on the neutral side, 11% respondents disagreed with it and 3% strongly disagreed with it.

Q 15: What is the impact of innovation and technology on the environmental conditions of Norway?

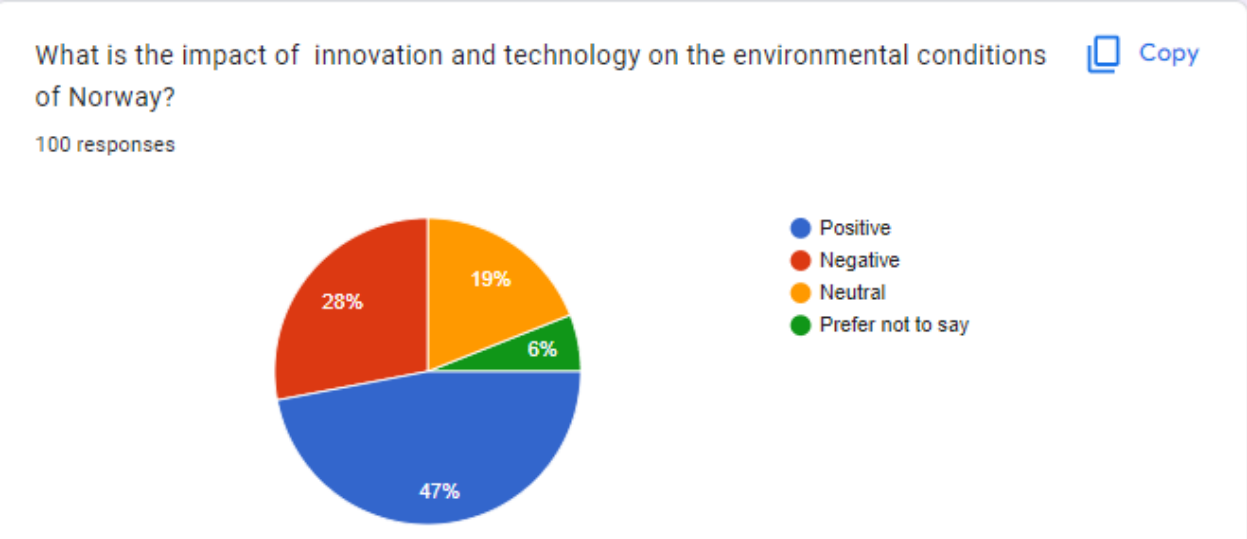

Figure 17: Impact of innovation and technology on the environmental conditions of Norway

It is observed or found in the survey that 47% of the participants believe that innovation and technology have a positive impact on the environmental conditions of Norway followed by 28% of the respondents in the survey have said that it has a negative impact whereas 19% were on the neutral who neither said positive nor negative and there were 6% of the participants who preferred not to say anything.

Q 16: On a scale of 1 to 5, how much would you rate the measures taken by the government of the country to promote innovation and technology in the country?

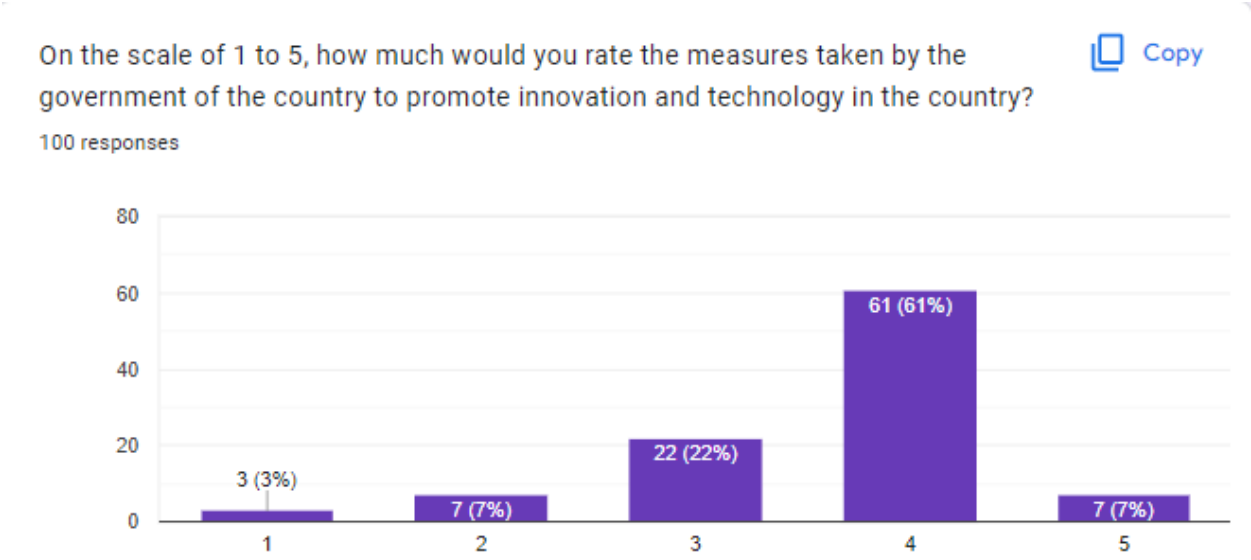

Figure 18: Rating the measures taken by the government to promote innovation and technology.

The respondents who were involved in the survey have rated the measures that have been taken by the government of the country to promote innovation and technology in the country where 61% of the participants rated it 4, 22% rate it 3 followed by 7% who rated 5 and 7% who rated it 2 whereas there were only 3% who rated it 1.

5.3. Discussion

The respondents who took participation in the survey were mainly from younger and middle-aged generations as these are the people who are more driven by innovation & technology. There were more male participants along with a significant proportion of people who preferred not to disclose their gender and the reason behind not doing so is that they do not want the findings of the survey to be gender specific with stereotypes, prejudices as well as opinions (Colclough et al., 2019). However, it has been identified that the business is in the need for creating an effective approach that is allowing the business in gaining and reducing the stereotypes. The innovation that is based on analysing through accounting while managing the overall performance and ensuring that all the action has been reduced through capital insensitivity. There has significant development in innovation and technology over time in Norway in every industry whether it is capital-intensive, labour-intensive, or both enhancing the exports in the country. The export activities in the firms of Norway are also quite frequent

which gives them a competitive edge or advantage in the global marketplaces. Many factors influence the export-related decisions in the firms and the major factors identified in the survey are competition, currency exchange rates along with environmental conditions. Talking innovation-based firms, have significant roles in minimising the effects of the economic deficit of the country such as giving the country a competitive advantage in the international market and increasing its export trade-off. The government of Norway does support the local firms in the form of global synergies to enhance the country's trade performance by optimum allocation of resources and improving the product-service quality of these firms (Azmi et al., 2023). Moreover, the application of the resources that has been used by the corporation on the quality of product that is being offered in the market. The exporting activities also include the management of exchange rates where valuation and innovation help the firm to predict the changes in the exchange rates. There is a positive impact on the environmental conditions of inculcating innovation and technologies in the operations of businesses. The government of Norway also supports local firms to promote innovation and technology in the country.

It can be analysed that innovation is playing a larger role in enhancing the exports of Norway-based companies. It can be ascertained due to the reason that the innovation has allowed these companies to create a more sustainable and expert exporting system that can reduce the risk that has been ascertained in the management of the funds during the system. According to views presented by Costa & Matias (2020), the management needs to enhance the level of creating a more appropriate management system for reducing the high ended risk. The valuation of the company is one of the key factors that is impacting the overall performance of the exporting functions. Moreover, the overall performance there is a need for expanding in the current market. The business is in the need for influencing the overall technology and innovation through which firm degree for the absorptive capacity in the business.

The ability of the companies is majorly influenced by the economic deficit in which the organisation is operating. It is because of the reason that the companies are requiring various financial and physical resources to aid the business and managing the level of managing exchange risks. Norway based companies have adopted various methods that are linked with the management of eco-innovation and reducing the problems that can help the company in gaining a competitive advantage for the companies.

In a similar context, the extension is important for focusing on enhancing the sustainability of the environment and focusing on the necessary changes that are needed to be implemented during the process and increasing the efficiency of the value chain so that the entire process of exports can be enhanced. As per the views presented by Saether et al. (2021), for this

enhancement, the company needs to focus on increasing the value and making sure that the necessary resources are included during the process of exporting the products to other countries. Innovation is the key element that is focusing on enhancing and making sure that the manufacturing controls that have been established during the process is having a high potential with increasing the value that is provided for ensuring that the products are constructed properly and carefully for increasing the commerce of the company. According to Abbas et al. (2020), green innovation is one of the key elements that is promoting the level of exports as this helps in generating value and getting a competitive advantage over various other companies that are exporting through increasing the sales volume.

Innovation helps to achieve multi-dimensional growth of both business organizations and the country through a strategic vision in resource allocation and utilisation for enhanced sustainable growth (Harjadi et al., 2020). Regional business clustering offers a competitive advantage and satisfies market demands through optimised systems, leading to high exports as well as enhanced supply chains-logistics. Businesses in the same area have the chance to utilize resources effectively and creatively, enhancing quality and exports through sustainable practices. As per the Porter diamond model, size and structure of firm plays a major role in the determination of market expansion strategies. It not only increases the ability of firms to adapt to change but also enhances the vision to learn through technological collaborations.

This is evident in the Norwegian salmon sector where factors like product quality and freshness are essential for increased trade volume. Knowledge-sharing and innovation are made possible by clustering businesses together which lowers economic loss and enhances sustainable growth (Nassar & Tvaronavičienė, 2021). The use of sustainable practices assists to increase the competitiveness of firms in both local as well as global markets. The increased ease in accessibility to resources encourages firms to access global markets. It also increases collaboration among stakeholders and suppliers for enhanced value addition to users through sustainable product delivery. Along with expanding exports and opening new markets, innovation also improves cost-effectiveness along with interactions across supply chain activities in both, small- and large-scale firms (Gherghina et al., 2020). This not only enhances the efficiency as well as the effectiveness of factor conditions of the Porter diamond model but, also assists to develop a skilled workforce for the execution and maintenance of technological innovations. As a result of its positive influence on exports, cost-effectiveness and innovation, clustering benefits the market in Norway for sustainable development.

The potential for offshore wind power to advance as a renewable energy source has led to process innovation for economic growth. It helps Norwegian firms to include cost-efficiency in their operations along with strategic resource management. This results in the economic growth of Norway along with new job creation, increasing the competitiveness of its firms in global markets. The system of technical innovation which is made up of both public and commercial entities aids in boosting exports, increasing sustainability, and reducing the budget deficit (Al-Jinini et al., 2019). The increased cooperation between businesses in Norway results in the diversification and creation of new products, leading to diversification by firms to global markets. Semi-structured interviewing techniques are used to discover possible market demands for the application of innovative solutions in business processes. This not only helps in boosting exports but also results in the liberalization of policies for innovation, improving the nation's economic conditions and strengthening its factor conditions of the Porter diamond model.

The changes in exchange rates affect a company's competitiveness and cash flow. Exchange rates for a more sustainable economy can be determined with the aid of system dynamics models. The per capita income and the balance of payments in Norway are impacted by government ownership of oil companies. This motivates businesses to invest in cross-border business along with the ratio of capital expenditure to cash flow influences market share and the value of a share. Choosing the balancing loop strategically aids in achieving a balance between interest and exchange rate, generating demand for the national currency as well as trade exports. It also increases innovations and helps in the exchange risk management of the firm boosting its value. The use of innovative solutions increases the ability of Norwegian firms to identify and manage exchange rate fluctuations. However, the exchange rate is in the correction for the competitive advantage through which the international market is operating the overall price competitive nature for the business to improve the experience and implementing the overall performance. The management is always seeking for expansion in the international market. Eco-innovation requires green capabilities which boost trade for Norwegian businesses. As per the Porter diamond model, gaining a competitive edge and opening new markets are made possible by advantages including improved efficiency, cost reductions along with the usage of renewable energy (Vlados, 2019). Green talents that are focused on education, as well as employment creation, can help Norway create products that are optimized and generate high revenue. It strengthens factor conditions and increases interrelation between related-supporting industries for the identification of future needs of users. Apart from this, it increases the ability of firms to accurately forecast market demand

and meet them through innovative products. The development of new products and higher exports, knowledge integration, localization of businesses, industry classification as well as increasing emphasis on economics, electronics along with automation are essential for sustainable development (Salunke et al., 2019). The increased involvement of businesses in green innovation processes assists in the development of improved products, expansion into new markets, expansion of trade and strengthening of Norway's economy.

Using innovation in the Norwegian white fish value chain boost exports, lower the country's budget deficit and generate new jobs. The usage of modern technologies has increased along the entire value chain from value capture to value consumption, because of changing market trends and consumer preferences (Martínez-Zarzoso & Chelala, 2021). As a result, there has been better resource allocation, less waste and higher-quality output. Furthermore, frozen storage has aided Norwegian businesses in growing their trade volume and reducing food waste. Finding a balance between industrial and consumer needs along with the use of the right technologies helps to determine where process innovation can be made to enhance exports (Udriyah et al., 2019). In recent years, sustainable practices have become increasingly important due to pollution and climate change on biodiversity. The shift from traditional methods to sustainable practices involves stages such as start-up, acceleration, and stabilization. This diversification helps to increase the efficiency of the value chain of petroleum suppliers in Norway. Additionally, the approach of the technological innovation system in Norway is affected by geographical and political aspects which help to foster knowledge sharing and improve technology exports. The development of the upstream technology value chain in the petroleum sector in Norway has enabled it to cut costs in its operations and sales, as well as create an equilibrium between innovations, production along with market factors. Diversification through innovation enhances focus on control policies and changes, resulting in increased exports and value generation through the technological shift (Barbieri et al., 2020).

The identification, as well as management of social and environmental issues, leads to the inclusion of innovative solutions in processes. Here funds from international organizations help to innovate and develop new products as per market trends. It not only increases the readiness to identify and accept change but also enhances social awareness regarding value generated through innovative solutions. The jobs created along with infrastructure developed through product or process innovation assist to develop synergy between market forces and resource utilisation for increased sustainable development (Dumitru & Ionescu, 2015). Innovation whether product or process helps to increase production with the proper use of available

resources. It not only helps firms to meet the current as well as future needs of the local market but also increases their capability to identify growth opportunities in global markets. Open innovation increases efficiency in product lifecycle along with identification of areas for workforce requirement. The increased efficiency in knowledge creation and sharing through innovation helps to maintain the firm's competitiveness (Strøm-Andersen, 2020). This ability to identify the need for change from the external environment assists firms to develop new knowledge for increased revenue generation. In Norway, innovation in the processing of seafood along with advanced storage technology helps to increase the quality and freshness of products, hence increasing exports. It not only leads to the development of proper logistics but also assists to increase inter-relation in the supply chain. The use of controlled processes assists to enter new markets with less challenge through innovative solutions. Furthermore, Qi et al. (2019) the rise of Bio-economics leads to new job creation along with increased value addition to end-user. It helps to decrease the economic deficit and encourages firms to access global markets. The inclusion of green innovation and strategy in firms increases the decision-making of stakeholders for potential investment in sustainable operations (El-Kassar & Singh, 2019).

Several issues as climate change, plastic pollution etc. hinder the ecological balance of the marine area and adversely affect sales of seafood in Norway. This has led to the development of a circular economy for reduced waste as well as recycling for the decreased economic deficit. The increase in cooperation and strategic planning between all channels from stakeholders to suppliers, customers etc. for sustainable development of the economy (Tsai et al., 2021). Innovation in waste management leads to the proper segregation of waste. Incineration leads to energy recovery which encourages firms to increase efficiency in waste reduction, leading to cost-efficiency in processes. This not only leads to high generation but also helps Norwegian firms to conserve resources, increasing the ability to control the economic deficit. The increasing trend of green innovation helps to increase the sustainable development of firms. It helps to increase innovation in processes for the development of new products. Apart from enhancing the diversification of firms to new markets, it leads to the creation of a supportive network between people, processes, and structure for sustainable development.

6. Conclusion and Recommendations

6.1. Overview

The firms that make innovative products have a competitive advantage over others in terms of growth and sustainability. To conclude, data has been collected through surveys, journals and articles and analysis has been drawn that innovation not only provides a competitive advantage but also helps to increase exports. Through building, technological infrastructure economic deficit can be minimized. Various recommendations have also been provided to increase trade performance in Norway and thereby achieve sustainable competitive advantage.

6.2. Conclusion

It is concluded that in today's competitive environment, innovation has grabbed the attention of firms operating at different levels. Innovation and competitive advantage are closely linked to one another as firms make innovations in their products or services to have a competitive advantage over others. Innovation is considered important for the progress of economy thereby providing benefits to the economy as well as businesses. The competitiveness of a country depends on the firm's capability to upgrade and innovate. Technological improvements in the products help in increasing efficiency and provide an opportunity to enter new markets.

In this research, the positivism research philosophy has been used which is used to collect knowledge about the innovation of technology and its impact on exports in the Norway region. This research study follows the deductive approach as it is considered a more reliable approach for testing as compared to the inductive approach. The case study research strategy that has been used in this research provides the whole direction of the research. The research choice that has been selected in this research is mono- the method where the data that has been collected follows only one type of study for the area of research. Data has been collected through the quantitative method of collecting data. Other methods have not been used to collect the data because multi-method involves the collection of data through both qualitative and quantitative forms but here in this research data has been collected through surveys and samples.

A survey has been conducted to collect responses and views where the data has been collected through 100 respondents. All the participants have various perspective that is being accounted using various secondary source of information to enhance the validity and reliability of the information. In the data analysis, it has been found that most of the respondents were aware of the export operations in the organisation where there are working as they believed that most of the organisation do export the products on monthly basis. Some respondents believed that

exports are mainly influenced by the prevailing competition in the market along with the currency exchange rate. Numerous analysis have been carried out using secondary primary and secondary research methods. It has been concluded that through making innovations and exporting the products at the global level Norway based firms can increase trade volume and move ahead of their competitors. Innovations in technological infrastructure will lead to economic growth as it will increase the level of productivity along with increased exports.

Most of the time the government of Norway supports innovation and technology in the firms and the level of trade and cost of production are affected by technological infrastructure up to a certain level. When there is a lack of infrastructure, the profitability of the firms can be reduced, the cost of production can be increased, and economic activities can be delayed. The firms situated in different geographical regions in Norway establish synergies to develop new products or processes through innovation. As per the analysis, the geographical synergies are made among the firms for innovation that helps in high trade performance in Norway. It also helps in the allocation of resources thereby enhancing the quality of products and services for the firms. It has also been analysed that innovation and supply chain helps to increase efficiency in the business through increasing trade performance. It will help the firms to increase trade and exports to different countries.

To make innovations in the products, technological infrastructures such as equipment, software and technology services are required. With the help of these infrastructures, the firms situated in Norway make innovations in their products and then make them available for export. Through synergies and collaborations, the firms can have the advantage of the skills and resources of other firms. It will also help to increase exports by exploring the market opportunities and provide assistance in improving logistics as well as the supply chain of the firms. As the export capabilities of the firms increase, the economic deficit can be controlled which provides a path for creating innovative and different solutions in the supply chain. Higher competition, environmental conditions and currency exchange rates influence the decisions that are related to export in the organisation of Norway-based firms. The role of innovation-based firms in reducing the economic deficit of the country is to provide a competitive advantage for the country in international markets and it also helps in increasing the export trade of the nation.

The coordination and interrelation among the different activities of the supply chain can be increased through innovation in Norwegian aquaculture. Green skills help in the production of innovative products while saving costs and managing economic deficits. The trade volume can be increased, and the Norway based firms can also gain a competitive advantage over other

countries. With the help of technological innovations, Norway based firms have to face long term changes in business, trade, and labour markets. As per the analysis, organisations are best described as it is capital-intensive. There is improvement in the trade practices, as Innovation in aquaculture and this supply chain is being facilitated with the acceptability of the newer markets. It is examined by the authors that there is the development of a low-carbon economic system in Norway. High trade is increased in farming and fisheries. Economical quantitative research is being made from investigating and by this in Norway, there is sustainable development. It is concluded that for resource management, Norway uses different sustainable practices along with increased volume in trade.

Various sustainable practices are adopted for recycling as there is a large amount of plastic pollution in the economy and it decreases marine ecology and with that, there is an increase in the economic deficit of the Norway based firms. In Norway, when there is an increase in export innovations in the management of resources, then this can increase the conservation of resources with the generation of revenue. Therefore, it has been concluded that the firms can achieve a competitive advantage by making innovations in products and processes which helps to increase exports thereby improving trade performance.

6.3. Recommendations

There should be an improvement in Norway's trade competitiveness by adopting digital technologies through the scope, speed of trade and by economies of scale. Digitization creates a positive impact on trade thereby increasing the profits of the firms (Matthess & Kunkel, 2020). There is the effect on all the stages of the value chain, production, pre-production and post-production of the trade and it helps in improving the access for the domestic firms for exporting new markets and domestic consumers are also exposed to the new products.

Plastic pollution should be decreased and for this purpose, sustainable practices for resource management should be used for the economy which will help in increasing the trade volumes (Mihai et al., 2022). There should be the use of innovative solutions for treating, filtering, and cooling the recycled pallets which can lead to the optimisation of different processes in the Norwegian firms. There is an increase in trade volumes in Norway firms and the economy of Norway can be strengthened, the volume of trade can be increased, and opportunities are there to access new markets with the help of increased firms' engagement in the green process of innovation. Eco-innovation helps non-green companies in the adoption of innovative goods, processes, and practices.

The performance of eco-innovation depends on the results of eco-innovation arrived from different activities (Kemp et al., n.d.). The exports in Norway can be increased by forming clusters among the people of Norway. The government of Norway should provide full support for innovation and technology in the firms. The use of innovative techniques will also help to expand the level of coordination between activities concerning the supply chain in Norway (Cigolini et al., 2022). There is collaboration among the firms and that can be increased by research and development. Different paths for the development of the new product are developed with the knowledge that has been gained. The economic deficit can also be controlled and exports among the different regions of Norway can be increased through innovation and proper utilization of resources. The currency exchange rates should be lower so that export can be done easily in the organization with the maintenance of good political relations.

To achieve sustainable growth, an export plan can be developed that helps in increasing green exports. It will also help in increasing profits and improving the performance of Norwegian companies. Innovations are required by every firm to achieve sustainable development goals (Guo et al., 2020). When the competitiveness of Norwegian firms increases, trade also increases. Technology transfer also helps in increasing the export performance of Norwegian firms (Martínez-Zarzoso & Chelala, 2021). The firms operating at the international level such as Norway may outsource some of the processes of product development which helps to take advantage of the skills and resources of other firms. Through outsourcing, the firms can have a competitive advantage over other firms that do not have innovative techniques. Outsourcing also helps to make the business more flexible and provides help to adopt the fluctuating conditions of the market thereby helping to save costs.

The firms must take steps to remove the barriers coming in the way of developing innovative products such as developing products as per the strategy, following the rules and regulations, and ensuring that all the systems are in place and appropriate innovative technology has been used. Innovations should always be encouraged at all levels of the development of the product to increase productivity. The cost of the products should be reasonable which will help the firms to increase productivity and profits. The firms in Norway must make efforts to increase the demand for their products which will help to develop more products and improve the economy of the country. Innovation helps in increasing productivity and reducing the cost of production which will help increase the export of the products. Data and information have been gathered from various sources that are based on which analysis and conclusions are drawn in relation to how innovation helps in achieving sustainable competitive advantage as well as

increasing exports. Based on the results, different recommendations have been provided to make Norway's economy more sustainable.

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Appendix

Appendix 1 Questionnaire

Q1. What is your age?

a. 20-25 years

b. 26-32 years

c. 33-40 years

d. Above 42 years

Q2. What is your gender?

a. Female

b. Male

c. Prefer not to say

Q3. Which industry do you work in?

a. Retail Industry

b. Food Industry

c. Agricultural Industry

d. IT Industry

e. Others …

Q4. What is the turnover of the organisation you are working in? (Approximate)

a. Less than or equals to 2 million NOK.

b. Less than or equals to 6 million NOK.

c. Less than or equals to 10 million NOK.

d. More than 10 million NOK

e. Prefer not to say

Q5. How would you best describe your organisation as?

a. The organisation is labour intensive

b. The organisation is capital intensive

c. There is a balance between labour intensive and capital intensive practices

Q6. Are you aware about the export operations of your organisation?

a. Yes

b. No

c. Maybe

Q7. How frequently your organisation involves in export activities?

a. Weekly

b. Fortnightly

c. Monthly

d. Quarterly

e. Not sure

Q8. What factors influence the decisions related to exporting in your organisation?

a. Political relations

b. Currency exchange rate

c. Demand of product in other countries

d. Inflation rates

e. Competition

f. Legal structure of other countries

g. Environmental conditions

Q9. How much do you agree with the statement, "Use of innovation and technology helps in enhancing exports in Norway?"

a. Strongly agree

b. Agree

c. Neutral

d. Disagree

e. Strongly Disagree

Q10. According to you, what is the role of innovation-based firms in reducing the economic deficit of the country?

a. It helps in increasing the export trade of the nation

b. It helps in strengthening the financial system of the country

c. It gives a competitive advantage to the country in international market

d. It helps in attracting foreign direct investments

Q11. Do you think the government of Norway supports innovation and technology in the firms?

a. Yes
b. No
c. May be

Q12. How do geographical synergies between the firms for innovation helps in high trade performance in Norway?

a. It helps in increasing cost efficiency of the firms
b. It enhances the quality of products and services of the firms
c. It helps in optimum allocation of resources
d. It helps in giving competitive advantage to the firms

Q13. How do the valuation and innovation of the firm help in managing the exchange rate changes?

a. In market positioning and competitiveness
b. In predicting the changes in the exchange rates
c. In increasing the demand of domestic currency
d. Others …

Q14. How much do you agree that value chain and innovation play significant roles in increasing trade performance of developed nations such as Norway?

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Q15. What is the impact of innovation and technology on the environmental conditions of Norway?

a. Positive
b. Negative
c. Neutral
d. Prefer not to say

Q16. On the scale of 1 to 5, how much would you rate the measures taken by the government of the country to promote innovation and technology in the country? (1-Strongly disagree, 3-Moderate, 5-Strongly agree).

a. 1

b. 2

c. 3

d. 4

e. 5