Blue Economy Innovation and Development.

A Delphi Study for Páirc Na Mara.

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I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of M.Sc./ PhD is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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Abstract: The aim of this research is to identify international best practice and the key aspects needed for the development of innovation centres for a peripheral region. The second objective is to outline the sectoral developments needed for businesses to operate effectively both economically and socially in rural areas. This thesis will examine this as a case study for Cill Chiárain in Connemara, a disadvantaged region in the West of Ireland which has had recent planning development underway to build an ultramodern marine innovation centre, Páirc Na Mara. This innovation centre will aim to revitalise the region creating opportunities and an attainable economic growth. First, the thesis presents a systematic literature review examining the challenges and factors which are prevalent in peripheral regions while identifying solutions and processes which may be established for these obstacles to be overcome. The literature component also examines various contributions that examine innovation centres and the common features which are needed for the innovation centres to become a hub to generate ideas, create products and allow for collaboration between the stakeholders involved to occur. This may lead to further interest of other enterprises seeking to become a part of this type of innovation hub. The second paper of the thesis presents a Delphi study conducted with the stakeholders of Academia, Industry, Government and Community. This was done to obtain the different views and opinions on various factors concerning the marine industry and rural regions which may affect the level of sustainability which Páirc na Mara will offer to the locality. The entirety of the surveys took place through Covid-19 which allows for interesting concepts to be formulated for the future of peripheral regions and the rise in remote working.

Overall, this thesis presents a case study to policymakers of processes which may be required for sustainable economic growth to occur in peripheral regions. This is completed through examining both rural development and the role of innovation centres in achieving sustainability. The research will provide a deeper understanding of the role of innovation centres and the features which allow for them to become a hub for collaboration and product development. The thesis also offers an insight from participants involved within the marine sector to issues which are currently being faced and how these obstacles may be overcome. This information will be essential for planners involved in the development of Páirc na Mara in Cill Chiárain to assuring attainable sustainability for the region and on its successful application may act as a guide to additional disadvantaged regions to processes which can be implemented to create a level of economic growth.

Chapter 1: General Introduction:

In 2017, Údarás na Gaeltachta[1] announced that a new ultramodern low carbon marine innovation centre, Páirc na Mara would be developed in Cill Chiaráin, a disadvantaged region located in Galway in the West of Ireland. The project has been described as a powerful potential driver for economic growth and opportunities. This will be a substantial boost to Cill Chiaráin as the area is deemed disadvantaged with a study completed in 2016 by Pobal HP Deprivation Index deeming it at a level marginally below average (Pobal, 2016). The centre is expected to bring a major transformation to Cill Chiaráin in the form of new business opportunities and in attracting start-up companies which will lead to sustainable, profitable job creation in the region. The initial investment has been estimated to amount to between €3-5 million with the scope of this initial investment most significant with neighbouring regions also expected to benefit from this capital investment in the region. The aim of the Páirc na Mara development will be to act as an innovation centre for marine related enterprise while creating a sustainable aquaculture industry within the region. This will be completed through encouraging marine related start-ups, facilitating research, development and cross-collaboration of actors within the development, increase marine related skills and expertise and attracting foreign direct investment. The long-term aim of the project will be to create a type of marine related cluster in the region with sustainable employment opportunities.

Figure 1: Location of Cill Chiárain, Connemara, Galway.

The blue economy as described by the European Union (EU) encompasses all industries and sectors related to ocean, sea, and coasts. This includes being based directly in the marine environment including shipping, seafood, and energy generation or on land including ports, shipyards, and coastal infrastructures (European Union, 2021). The ocean economy is Ireland's fastest expanding economies with a turnover of €6.2 billion in 2018. The growth of the national economy is 2014-2016 was 16% while the ocean economy was 33%. The marine sector has also had a contribution of €4.19 billion to GDP in the means of direct contribution of €2.2 billion and

[1] Údarás na Gaeltachta meaning "Gaeltacht Authority" is a regional state agency which is responsible for the economic, social, and cultural development of Irish-speaking regions of Ireland.

an indirect contribution €1.96 billion (SEMRU, 2019). The industry has employed over 34,132 people and has seen consistent growth of 13% from 2016-2018. The sectors within the marine industry who intend to benefit from the innovation centre are in line with those listed in Government's vision Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland.

The main industries in which growth was predicted for in 2020 were in both traditional and emerging areas such as seafood, maritime commerce and ship leasing, marine and coastal tourism and leisure, marine ICT (Information and Communications Technologies), biotechnology, ports and maritime transport services, maritime manufacturing, engineering, offshore oil and gas and various other marine industries (SEMRU, 2019). According to Socio-Economic Marine Research Unit (SEMRU) in their 2019 report marine commerce, marine biotechnology and bio-products experienced the largest increases in turnover and GVA (Gross Value Added) over the 2016-2018 period. In national discussions on economic growth several industries lead the way, these industries generally fall into the sectors of pharmaceuticals, information technology and food and beverage (CSO, 2019). The sectors which held potential but that there was a failure to utilise were mainly in areas such as marine aqua-culture, renewable energy and tourism. These potential marine growth areas have now been given the further support needed from the announcement of the Páirc na Mara development. This type of initiative will enhance the Government's Harnessing our Ocean Wealth Action 19 policy and help it to overall accomplish the aims set out in Innovation 2020, Ireland's National Research and Innovation Strategy where sustainable development of the marine economy was discussed as a key national objective (SEMRU, 2019).

The aim of this research is to identify international best practice and the key aspects needed for the development of innovation centres for a peripheral region. The second objective is to outline the sectoral developments needed for businesses to operate effectively both economically and socially in rural areas. This research will examine the obstacles and challenges which the development of these innovation centres may be subject to and allows for a more condensed guide to how these issues may be overcome. In examination of peripheral regions, Ireland has been confronted with challenges in a range of different sectors. These adversities have taken formation in a range of sectors which include population, skills development and infrastructural development issues in areas such as transport links, housing and broadband capabilities. Other issues which are prevalent in society are the uneven distribution of policy incentives between urban, coastal and rural regions nationally. (Kelly et al, 2021)

This research presents two papers, the first being a systematic literature review of difficulties prevalent in economically declining peripheral regions and identify processes which could be implemented to reverse this and create economic growth for the declining regions. The research will also examine successful innovation centres and what were the leading factors which led them to achieve sustainability and further idea generation, job creation and economic growth. Although there have been studies compiled based on rural regions, no study exists where the innovation has been led from the development of an ultramodern marine innovation centre located within a disadvantaged region.

The second paper of this thesis involves a qualitative research method being conducted known as the Delphi method to explore obstacles impacting the marine industry. This process involved gaining an insight of the marine industry which involved various members of the stakeholders' groups of Academia, Industry, Government and Community. By conducting this method, it allowed for solutions to be compiled to overcome the barriers which currently present themselves to this sector. Previous studies based on the marine sector had not been completed since the impact of Brexit and Covid-19. By conducting this Delphi method, it allows for a wider range of opinions on the industry and will act as a comprehensive guide to what features, platforms and processes are needed for Páirc na Mara to be successful and create economic growth in Cill Chiárain and the wider region. This research may also act as a guide to additional rural areas to how economic growth and opportunities may be created. The next chapter presents the systematic literature review exploring rural development and innovation centres. Chapter 3 introduces the Páirc na Mara project as a case study and presents a Delphi study analysis conducted with stakeholders involved within the marine sector and the Cill Chiárain region. The thesis then concludes with a final General Conclusion chapter.

Thesis Structure:

The structure of the thesis will be as follows:

Chapter 2 will give an insight into the systematic literature review which was conducted. This segment will explain the framework and in how to conduct a systematic review. The chapter then will delve into two key sections which were Lessons from Rural Development Literature which common themes which were found in literature are discussed which include: Capabilities, Policy Intervention and Regulation, Infrastructure Requirements and Social Innovation. The second section which is discussed is Lessons from the Innovation Centre Literature which the common themes which were discussed were Knowledge Transfer and Collaboration, Spin Out, Knowledge Clusters and the Triple/Quadruple Helix with the final section of this chapter consisting of the General Conclusions and Prospects for Rural Development.

Chapter 3 will Identify challenges and opportunities in innovation and business development for the blue economy: A case study for Ireland. This section will comprise of an introductory section explaining the need for this research and the Páirc na Mara innovation centre which is being planned to be developed in Cill Chiárain, Connemara, Galway. The following section will examine the policy issues surrounding the development and the blue economy. This will be followed by a section on the Delphi methodology which was conducted as part of the research analysing both its use and its implementation. The results obtained from the surveys conducted as part of the research are than discussed. This than follows with a discussion and conclusion section of the research conducted and results obtained.

Chapter 4 will give an overall general conclusion to the research conducted and the information obtained in completing the objectives set upon in the introductory section of this research which is to identify the international best practice of the development of innovation centres for peripheral regions and to outline the sectoral developments needed for businesses to operate effectively in rural areas.

Chapter 2: Systematic Review of Innovation Centres for Peripheral Rural Areas.

Abstract: This paper presents a systematic review of the key aspects needed for a successful innovation centre to operate in peripheral rural area. The paper also explores the international best practice for the economic and social development of peripheral rural areas. The aim of the research is to provide a systematic review of obstacles and challenges which the development of these centres may face and allows for a more condensed guide to how these issues may be overcome. In terms of development of rural regions, Ireland has often been faced with obstacles and challenges in a range of different sectors. These adversities have been in areas such as population, skills development, and infrastructural difficulties in areas of broadband network and capabilities, transport links, adequate housing, and a consensus of an uneven dispersion of policy incentives to urban and coastal communities leading to an enhanced perception and feeling of economic decline by these rural regions nationally. This research presents a systematic in-depth review of the literature involving rural regions, innovation and opportunities which can create employment opportunities leading to a generate attainable economic growth in peripheral rural regions. This information will act as an instrument of reference for peripheral regions in how to obtain economic prosperity.

Keywords: Rural, Peripheral, Policy, Digitalisation, Knowledge Transfer, Capabilities.

2.1. Introduction:

This research paper has a double objective. The first objective is to identify international best practice in the development of innovation centres for peripheral regions. The second objective is to outline the sectoral developments needed for businesses to operate effectively in rural areas. This study has been conducted to act as a guide to state agencies and policymakers involved with the development of Páirc Na Mara which is a marine innovation centre which is proposed to be in the disadvantaged region of Cill Chiaráin, Connemara in the West of Ireland. This research examines literature concerning rural development, rural policy, platforms, practices and processes which are required to achieve sustainability for peripheral regions and innovation centres.

Two questions are analysed and addressed by this systematic literature review: (1) What developments are needed to maintain attainable idea generation and productivity in innovation centres? (2) What developments are needed within rural communities and peripheral regions to create sustainable economic growth and job creation? By answering these questions, it will contribute to future research while acting as a guide to policymakers to modernise requirements of rural regions in a post-Covid landscape. These alterations in human behaviour and working life have led to a more remote orientated lifestyle with a vast majority of workers being given a work remote option leading to people reconsidering their work location and opting to relocate to more peripheral areas and counties. By rural regions displaying themselves as a destination with high-speed digital technologies and infrastructural requirements it can lead to an influx of people relocating to the area and recreating an area of growth and prosperity.

The outline of this chapter is as follows:

Section 2: Towards a Systematic Literature Review & Conducting the Systematic Review:

Section 3: Lessons from the Rural Development & Innovation Centre Literature:

Section 4: General Conclusions & Prospects for Rural Development:

2.2. Towards a Framework for a Systematic Review:

The context of this study is to examine the factors which can affect the level of innovation and economic growth within a region. The aim of this research is to create a systematic review of literature which examines growth influencers within peripheral regions and adapt these to Cill Chiaráin in which a proposed ultramodern marine innovation centre will be located.

From the review of literature conducted there are several themes which were essential to assure the sustainability of a region. The variants needed for creating growth within peripheral regions included Capabilities of Regions, Policy Interventions & Regulation, Infrastructure Requirements and Social Innovation. On further investigation of the sustainability of innovation centres, knowledge transfers were seen as vital which could be achieved through various methods including Spin-Out, Collaboration, Knowledge Clusters and the Triple and Quadruple Helix.

Although there has been research conducted on peripheral regions and the developments needed to attain sustainable economic growth, there still is a significant development needed for businesses to grow from these activities and to create a hub of cross collaborative creativity and growth which is highly associated with innovation centres. The research aims to identify international best practice and the key aspects needed for the development of innovation centres for a peripheral region. A secondary aim is to identify what supports are needed for peripheral regions to operate competitively with urban regions. By identifying these supports, this research will act a guide to policymakers and planners to what is needed while establishing the difficulties which may occur if a solution to the urban and rural divide is not established.

2.3. Conducting a Systematic Literature Review:

The systematic search is conducted with key words and concepts from academic disciplines which dealt with developments within peripheral areas with the search being focused on countries in the EU (European Union) as these countries were the most comparable regarding policy and strategy implementation. In the analysing of innovation centres, the search was global but primarily focused on Europe. Together these two topics formulate the theme of the research, a set of keywords to search the literature was used, specifically, 'Rural Capabilities' OR 'Rural Policy' OR 'Smart Specialisation' OR 'Rural Infrastructure Requirements' OR 'Social Innovation' AND 'Knowledge Transfer' or 'Triple Helix' or 'Knowledge Clusters' OR 'Spin Out Enterprise'. The databases which were used in this research were accessed through the Galway-Mayo Institute of Technology Library which included Science Direct[2], ResearchGate[3], EconLit and Business Source Complete[4] which all could be accessed remotely. These databases were selected as they covered a considerable scope of papers from an array of different sources related to our research question. The search was concluded on the 4th of June 2021, as part of the selection criteria only academic peer reviewed journals were selected for the review disregarding other forms of non-reviewed publications such as books, conference papers and media sources. Initially 173,767 were identified using the search terms. From this the search was filtered further by a relevantly recent year of publication reducing it to 128,707 filtered further by subject area and publication title to 2,554. From these articles' abstracts assessments were made on their relevance to the study being conducted which was then further analysed by their text content leaving the total to 28 research papers being analysed on rural development and innovation centres. This was completed over a timeframe of March 2021 until the end of July 2021.

[2] 'ScienceDirect' is a website which provides access to a large bibliographic database of scientific and medical publications of the British publisher Elsevier. It hosts over 18 million pieces of content from more than 4,000 academic journals and 30,000 e-books of this publisher. (https://www.sciencedirect.com/)

[3] 'ResearchGate' is a professional network for scientists and researchers. It has over 20 million members from all over the world who use it to share, discover, and discuss research. They are guided by a mission to connect the world of science and make research open to all. (https://www.researchgate.net/).

[4] 'Econlit' & 'Business Source Complete' are published by the American Economic Association and provides bibliographic coverage of economics related literature. EconLit includes information that is of prime relevance to many industries and research establishments world-wide. American Economic Association (aeaweb.org)

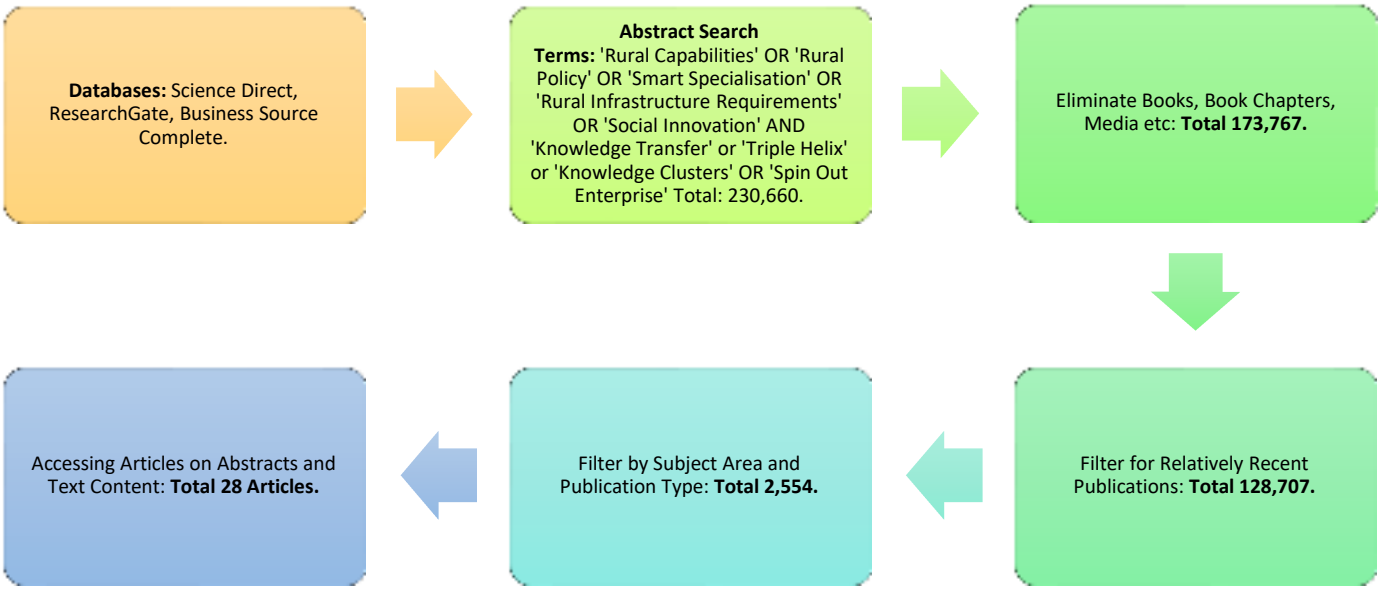

Figure 2: The Systematic Review of Literature.

2.1. Lessons from Rural Development Literature:

The research which is explored under rural development are based on case studies and scenarios in which rural development has been deployed successfully to transform a region to create an environment of creativity and innovation which will lead to job creation, economic growth which will in turn lead to an enhancement in the quality of life which serves its residents. In this section the leading factors to developing a peripheral region will be discussed. These factors include *Capabilities of a Region, Policy Intervention & Regulation, Infrastructural Requirements and Social Innovation.* These themes were selected as they proved to be most prevalent throughout the literature concerning rural development.

2.1.1. Capabilities:

The idea of regional capabilities is a recurrent theme in literature involving regional and rural development. The process involves a region examining activities and implementing a strategic approach to optimise the return of job creation, opportunities, and growth to the region (Soursa, 2007). Walsh, (2019) also examines the entrepreneurial ecosystem and how workers may utilise the skills and capabilities gained by further applying them to a new venture or employment opportunity. The capabilities discussed were those which were evident in the industry of technology and the link between founders of indigenous start-up companies having extensive prior experience in the industry. These skillsets and attributes developed can be from a certain standard being required in their past employment. This type of organisational mindset and expectation can then be transferred to new ventures entering the market.

Raisanen et al, (2020) discusses the idea in a case study of Finland which examined the digitalisation of micro-businesses and the digital divide which is prevalent in Finland and throughout Europe. This lack of digital infrastructure within regions of Finland is primarily due to the excess costs of higher speed broadband and restricted option given to rural communities. The difference in digital capabilities being offered may enhance the divide between rural and

urban, which will reduce the level of competitiveness in the market. (Alam et al, 2018) define the digital competence found within rural communities as, *"the capacity and capability of different stakeholders to embrace the emerging technologies".* Without proper knowledge of digital innovations and skills to use them, internet connections do not help rural communities and enterprises (Salemink et al, 2017). For businesses to stay competitive within Europe enhancing their skills and talents is a necessity (Raisanen et al, 2020). A method explored to combat this is the introduction of workshops to businesses in that region to increase their awareness of the digital market by spreading information. This encourages a positive attitude toward digital innovation and for planning the use of innovation. This worked effectively in Finland by following the factors of trust, communication and the changing roles of agents and opinion leaders (Raisanen et al, 2020).

Capabilities is also an underlying theme in Suorsa (2007). The author explains the importance of region identifying their own highest capabilities and pursuing it. By deploying this type of activity, it eliminates wasteful production and optimises output leading to an enhanced product and profitability. The author discusses how this type of initiative can inspire ancillary enterprises to set up within a region further creating opportunities. To promote this type of entrepreneurship in skilled capabilities education and training must be allocated to each individual region. By adapting these processes, it will further upskill the workforce which can lead to a retention of young people and prevent them migrating to urban regions if they know there are possibilities of gaining qualifications and employment in their home region (Soursa, 2007).

Capabilities is examined further by Criado-Gomis et al. (2020) where the connection between sustainable entrepreneurship and customer value creation is analysed. The study examines how companies in operation can have a sustainable entrepreneurial orientation with a positive performance to customers even if they possess limited financial capabilities. This is attributed to organisations ability to detect opportunities and having an optimal management system in operation. The research notes firms possessing these capabilities to meet the market demand is a leading factor for businesses to meet a new customer base. The research concludes that by firms adapting a rapid nature is most efficient in achieving competitive advantage (Criado-Gomis et al, 2020).

An alternative outlook to the role of capabilities has been noted by Nordin & Malik, (2015) which analyses a variation of graduates to identify key characteristics which they possess which could enhance their possibility of becoming entrepreneurs in the present high-tech innovative society. These characteristics which were identified which led to entrepreneurship were creative thought, systematic analysis, and self-confidence. This is the main novelty of this research as it is not mentioned in alternative literature. It is pivotal for businesses to encourage graduates to think differently and identify alternative solutions to traditional problems. The research notes that a principal factor for students to become entrepreneurs is by having the time while a student to develop thoughtful, critical, and reflective thinking processes which are essential to creativity and product innovation.

2.1.2. Policy Intervention & Regulation:

2.1.2.1. European Policy & Strategy:

The effect of European Policy has a positive outlook in the Hasche et al. (2020) case study of a robotics initiative in Sweden known as Robotdalen. In which it discusses the policy which has enabled the project. Regional Innovation Systems (RIS) were used to create new jobs while developing the standard of living with new and improved products and services. The research notes the European Commission highlights in the EU 2020 Strategy that each RIS should be based on the specific knowledge located within that region where regions can build on their own strength and knowledge (European Commission, 2012). The ideal of the EU Strategy is that there will be a regional advantage in the uniqueness of the region and the firms through collaborating innovation (Nordberg, 2015). Robotdalen is financed by the Swedish Government Agency for Innovation Systems (VINNOVA), the EU Regional Development Fund, municipalities, counties, and industry representatives. This support from various governing bodies has led to Robotdalen securing their position on the global robotics scene.

Knowledge-based development strategies put a sequence of policies in place to promote knowledge transfers by establishing businesses in a certain location. Morrison (2018) has displayed how the implementation of this strategy has worked efficiently in the Medellin, Barcelona, and Paris. In the study, success can be accredited to the collaborated space where policy is managed so that it allows for the social meeting to occur with the theme throughout that of local development strategies. This allows for the interaction of Industry, Academia and Government with the Quadruple Helix[5] allowing for the Community to become part of this knowledge growth opportunity. By continuously involving stakeholders in projects, it keeps morale high and by setting up long term projects keep motivation high. By following this *'open policy'* these centres will then eventually become a location for intermediary institutions, knowledge-based start-up, venture capital companies, research groups and R&D (research & development) centres. This comes accompanied with added amenities establishing themselves to create a face-to-face cross channel communication environment (Morrison, 2018).

2.1.2.2. Smart Specialisation:

This is a place-based approach characterised by the identification of strategic areas for intervention based on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discover Process (EDP) with wide stakeholder involvement. It is outward looking and embraces a broad view of innovation (European Commission, 2021). It has become a leading method for peripheral regions to become revitalised on a path to generating economic growth and sustainability. Soursa, (2007) examined this in the Nordic regions where policy was adjusted to allow for regions to focus on their strengths, leading to maximum output and increased economic growth. These new types of strategies to overcome economic decline of regions have evidently worked in dismissing the drawbacks which are regularly persistent with regional disparities and overcome issues such as population decline.

[5] The Quadruple Helix innovation framework describes university-industry-government and community interactions within a knowledge economy.

Biagi et al. (2021) also examines this topic which it describes as place-based thinking where key stakeholders develop a shared vision by means of dynamic and entrepreneurial discovery. They follow on prioritisation of public resources in knowledge investments to strengthen competitive advantages. It has five main characteristics:

- To focus on key national priorities.
- Emphasis on regional strengths, competitive advantages, and potential for excellence.
- Encouragement of technological and practice-based innovation to stimulate private sector investment.
- Involvement of stakeholders.
- Inclusion of monitoring and evaluation systems.

The study examines regions which may choose tourism to implement smart specialisation. The regions which had been examined had already an evident level of tourist flow, an area which may have capability to transform themselves and regions with natural and cultural resources. The tourism industry is noted as growing and more resilient to economic shocks. Regions already established in tourism should continue while it may not be beneficial for lagging regions. It was noted from other academics, (McCann & Ortega-Argiles, 2013, Capello & Kroll, 2016) that a good starting point despite its weaknesses with the potential drawbacks: Institutional conflict, governance, mobilisation, shared vision, and capability.

This type of examination of tourism through smart specialisation is also evident in Romão, (2020) from which the research discusses using an analytical model. This modal would identify the most significant sectors contributing to economic growth in these regions where tourism would be assumed to be a sectorial strategic priority. The research notes the role of tourism in the broad regional development and innovation strategies as opposed to destination management. The ancillary activities which can benefit from the specialised tourism are food and beverage, retail, entertainment, mobility and transportation or energy production. Alternative activities are open-air related to natural features, landscapes and 'creative tourism' which include activities from advertising, gastronomy to performing arts. These are notably defined as 'knowledge-based creative activities that link producers, consumers and places by utilising technology, talent or skill to generate meaningful intangible cultural products, creative content and experiences'. (Romão, 2020, Pg 3)

The research examines three different areas of this tourism which are tourism growth and resilience, vulnerability and shock absorption. The research notes in terms of growth and resilience a high level of tourism and specialisation exerts a positive performance. While those practicing within relation to workforce employed has a negative correlation of growth. This means growth can be generally achieved through strong tourism in highly productive activities as if it is labour intensive it can be negative. The sectors which had higher aspects on growth with tourism are agriculture, food production linked through hospitality and health services which is linked through wellness tourism.

Vulnerability was also reduced through a high share of tourism activities but the higher the employment level the more vulnerable the region became. This was evident in shock absorption

as although more developed regions are stronger to recover. Tourism demand can have a positive impact on the recovery process but not enough ability to absorb the shocks. Romão, (2020) concludes the research that tourism specialisation creates a positive impact when observing growth or recovery but not necessarily for when examining vulnerability and shock absorption. Through the specialisation priorities defined within the RIS with tourism it can provide a positive contribution to the regional economies with activities with strong connectivity to tourism also offer positive contributions to regional economies and growth and resilience (Romão, 2020).

Smart Specialisation is also examined in Hasche et al. (2020), the research explores how Micro–Swedish Regional Innovation Systems which by following a smart specialisation process has become a hub for the manufacturing of Robots. The overall aim of Robotdalen is to *'enable commercial success of a new robot innovations, focusing on technical solutions for industry, service and healthcare'* (Robotdalen.se). By the region adapting to robotics, they have now become a world leader in robot-based automation with a focus on three distinct areas within robotics. These areas include mobile robots providing service, innovative automation for industry and technology for independent life with immense potential growth opportunities available down the line. When Robotdalen was established, there was no other global firm in the region but due to the excellent capabilities in robotics it has now attracted companies globally. The initiative had developed 45 new products and created 28 new firms before the end of 2017 (Hashe et al, 2020).

2.1.2.3. Domestic Policy:

North & Smallbone, (2004) examines negative experiences in Greece where there is a top-down approach to policy. These policies are conducted through a European and National perspective which leaves rural regions underrepresented. Issues in policy are due to differences in perceptions in what motivates Greek entrepreneurs as the running of business is highly labour intensive with low profitability which is a direct feature for the low level of economic development in Greece. The factors which fail to be examined are the conservative management style and failure to apply itself to a knowledge transfer environment with alternative organisations. Policies which work effectively are those which allow for local involvement in project formulation and implementation. The LEADER program helps rural communities across the European Union to actively engage and to direct the local development of their area through community-led local development. This includes supporting private and community groups who improve quality of life and economic activity in rural areas. (gov.ie, 2021)

The problems shown are lack of integration for products through businesses which are successful. An example of this being Greek tourist resorts. Policy issues are national amounts of finance not equalling those which LEADER has agreed to allocate. The research conducted explores how investment in ICT (Information and Communications Technologies) has been a significant method in achieving economic growth, but telecommunications companies will not invest as the demand will not justify the supply. The case studies of Portugal and Greece display how vital it can be for countries to accustom policy to aid disadvantaged regions while acknowledging the social and cultural traditions already present. This is evident in growth attempts in Greece where the failure of their economic advancement by working collectively is

out of context with what it considered a social norm. This led to the program not being used to its full potential.

Innovation strategy has worked effectively to enhance a region in more developed countries such as Germany and the United Kingdom (UK). These countries have had a longer history of public intervention and alternative policy tools to support enterprise development and more effective ways to develop them. In the German context of Waldshut and Nordwestmecklenburg included: expansion of small enterprises in food processing and timber industries, support for development of farmers markets and achieving enhanced social integration (North & Smallbone, 2004).

In the UK in Devon and Cornwall projects have achieved higher levels of cooperation between existing farm enterprises which included a cooperative formed by Cornish farmers and electronic identification and traceability of cattle to improve farm efficiency and obtain marketing advantages. These were examples of policy meeting the needs of local economies and local communities throughout. It is noted that these micro-enterprises depend more on local and regional as opposed to national and international. Policy initiatives have been modified by regional and local level institutions which achieves a strong fit with local needs and circumstances. Additionally, it is noted that the UK and German cases were more efficient in ICT usage and innovation from the higher level of education they possessed in comparison to Portugal and Greece (North & Smallbone, 2004).

2.1.2.4. Open Policy:

Ryan & Giblin, (2012) discuss spatial divisions and calls for policy to be amended to assure collaboration can occur between enterprises. This would be led by strategies being directed towards promoting a variation of supports ranging from financial aid, workshops in social innovation and enterprise, research & development (R&D) and training opportunities. Autio & Levie, (2015) when discussing the importance of cross-collaboration note how for efficient innovation to occur policymakers must create a space for stakeholders to participate in and further develop the ideas which are generated to allow for them to come to completion. Garcia-Cortijoa et al. (2020) also recommends this which it states how policy needs to be examined to develop R&D supports to create a platform for regional businesses as to innovate, generate ideas and create employment. Bosworth et al. (2016) concludes the research by explaining an approach for local communities to shape local development is to work with policymakers to share visions and contribute to potential sustainable projects. This ‘community crossover’ can give stakeholders an additional perspective to certain obstacles once identified.

The theme of policy to promote rural development is a notable one in this research which five different national contexts of rural social innovation is examined. This research conducted by Bosworth et al. (2016) was to gain a more concise understanding of social innovation and the drivers for it to occur and to bring sustainability to the region. It also explored how policymakers could integrate social innovation into the design and evaluation of new rural development, policies, and programs. The case studies analysed were of Denmark, England, Finland, Italy, Holland, and Romania. It notes innovation is a process which requires a platform to create something novel while also noting the applications which are already present. These included: funding allocation, innovative approaches delivered by organisations and the outcomes delivered

in these communities. It concludes that policy design and evaluation must find mechanisms for social impacts that may result from economic interventions. Prompt engagements with communities in shaping local development by implementing these types of actions can promote policy interventions on the ground (Bosworth et al, 2016).

Policy needs to be *'open'* for cross collaboration between stakeholders. A procedure in which this may be implemented is by bringing together locals and decision makers to achieve shared visions, discuss sustainable projects and innovative workshops. There must be freedom given to ignite change in an experimental testing landscape. A leading factor in ideas being abandoned and failure to pursue is due to too much 'red-tape' in place. Suorsa, (2007) examined how regional innovation has successfully been implemented through adjustments made to domestic policies within that region. This has been achieved through smart specialisation which allows for regions to operate in activities which optimise production. This process was carried out in Finland, Denmark, and Sweden where there was a problem with retaining graduates. To combat this, polices were customised at national level to better serve the more affected regions which allowed for regional innovation systems and higher education institutions to operate efficiently.

This shift in national policy allowed for regional innovation systems and higher education institutions to operate efficiently. In Nordic countries it is essential for citizens to have equal rights to social development but the issue with the implementation of this strategy toward policy is it fails to fully define the difference between regions. The results from this extend to widely benefit regions which choose to focus on their strengths. Soursa, (2007) states that, *"the threat is that regional disparities will grow, to secure balanced regional development, public policies need to create programs to develop regional opportunities for innovation activities"* (Soursa, 2007, P26). This concept of policy being implemented to benefit everyone as equal but failing to accurately measure a regions limitation is interesting. At a certain stage, the benefits from further growth will discontinue and instead will be replaced by a divide in the advancement of a region.

North & Smallbone, (2004) explores two policies which create enterprise while strengthening competitiveness and viability of existing rural enterprises. One of these policies ideas is to build the entrepreneurial capacity of rural regions by providing opportunities for acquisition of business through education and training for potential entrepreneurs. This can include immigrant or minority groups underrepresented within society. The groups are given advice and guidance on procedures to develop an enterprise. Additionally, an approach is to enhance existing businesses by assisting people to upskill to meet demands in market trends. An alternative policy to assist developing infrastructure for rural regions is also noted, but these types of EU Policies are designed for Europe in general as opposed to tailored to each countries specific needs. Several of these developments have been achieved through LEADER which has an objective to assisting rural development but within these countries there is minimal policy implemented nationally which can enable opportunities and employment.

Knowledge-based development strategies put a sequence of policies in place to promote knowledge transfers businesses in a certain location. Morrison (2018) explored how the implementation of this strategy has worked as the Triple/Quadruple Helix model have led to growth in Medellin, Barcelona, and Paris. The further success of these regions is accredited to

how policy is managed by promoting local development strategies through social meetings in collaborated spaces. It allows for the interaction of Industry, Academia and Government with the Quadruple allowing for Community to become a component of the knowledge growth opportunity. By involving stakeholders in projects, it keeps morale high and by establishing long-term projects it keeps motivation prominent. This *'open'* policy will eventually allow these centres to become centres for intermediary institutions, knowledge-based start-ups, venture capital companies, research groups and R&D centres. This comes accompanied with added amenities establishing themselves to create a cross channel communication environment (Morrison, 2018).

This open policy has been examined by Autio & Levie (2015) in entrepreneurial ecosystems and start-up economies and how they have gained a vast amount of traction but with limited theory surrounding them. It examined ecological economies and the challenges faced by the entrepreneurial ecosystem policy analysis, management and elaborated the implications they possess in the future for policy practice. Stakeholder consultation and participation are needed to enhance the understanding of how the system works and how to install policy actions which will deliver results. Stakeholder choice should be chosen based on influence within the ecosystem. The study found that deep stakeholder engagement is essential in creating policy and how top-down policy declarations arguably remain a constant in entrepreneurship and policy initiatives vulnerable to capture by politicians. Similarly, most policy initiatives remain isolated, consistent with market and structural failure approaches and comprehensive, ecosystem-wide action views. Therefore, many have failed to replicate the successful innovation hubs such as Silicon Valley. Effective management of ecosystems is only successful when management clearly understands the distinct challenges (Autio & Levie, 2015).

The focus on policy is also evident in Garcia-Cortijo et al. (2019) and how it is a major component in retaining collaborative innovation between firms in small regions. Entrepreneurial ecosystems are complex and because of this EU policy and strategy which supports R&D needs to be analysed to assure efficiency. The economy does not follow a preconditioned set of guidelines with innovation occurring among stakeholders in a collaborative supportive environment. Regional policy needs to be implemented with attention drawn to how that individual system operates, its functions, the methods involved, techniques and tools which are required to assure collaboration, innovation and obtain results for peripheral regions. A contribution from research conducted by Garcia-Cortijo et al. (2019) is for policy to be implemented effectively it is key to educate policymakers of the challenges and limitations which enterprises in low growth regions may experience and introduce adequate supports which can counteract the possible impediments, protect business, and identify opportunities and collaborative innovation.

2.4.3. Infrastructure Requirements:

2.4.3.1. Transport:

Mounce et al. (2020) examines mobility in rural regions and how this can directly affect access services which can deliver substantial benefits to and improve the quality of life. The research examines the role of government in supporting transportation services to a level that will enable

access for its citizens. A cluster analysis is completed to identify the different segment of citizens across Europe while also examining good practice and innovation in rural transport across Europe. Limited demands for travel make it economically unfeasible for transport operators to handle the range of services which are necessary to meet the demand of people's mobility requirements which diminish transport offerings which further diminish the demand for travel. This vicious cycle could have been avoided if measures had been implemented at an earlier stage to assure the levels remained suffice.

A direct implication of this opinion of travel by rural residents is the over-reliance on private car as a mode of transportation. This can lead to a further reduction in accessibility and further decreasing the quality of life. The research found that the most impacted by this is the most vulnerable who may not have the resources to own their own vehicle (Shergold et al, 2012). This can also restrict members of the locality in availing of job opportunities due to the inadequate level of transport services (Wright et al, 2009). The research states ideally there would be an efficient, comprehensive, and coordinated multimodal transport system which could link local communities, but which is not the case due to austerity measures throughout Europe. This issue is further increased with peripheral regions suffering from an ageing population and depopulation. Health and educational services are also inaccessible to an extent due to the failing transport system brought upon by unfeasibility or not as prevalent for people to use which calls on state agencies to act to assure equality for all citizens and supporting the right to live in peripheral regions.

In terms of rural mobility there are areas noted which neither fall into categorisation of rural or urban which can be further analysed by which criteria is used in assessment. The ones explained are the Eurostat classification of rurality which divides into states, regions or provinces based on the population and their dispersion. From these criteria, Europe is noted as being predominately rural in territorial terms while another criterion used in Scotland was the drive time proximity to the next village, town, or city. There are services which become established which offer more flexibility and can fill gaps left by public transport (Velega, Nelson, et al, 2012). There are ideas from Mulley et al. (2012) discussed which note that DRT (Demand Responsive Transport) is generally a flexible routing of small and medium sized vehicles. These vehicles operate in a shared ride mode between pick-up and drop off locations according to passenger needs which leads to a type of ‘door-to-door’ service. (Mulley et al, 2012). These types of flexible transport perform a valuable role as a feeder to public transport network providing an integrated and efficient public transport offering (Mulley et al, 2012).

In examination of subsidies, the UK and Italian funding was reduced for rural and increased for urban. The explanation for this being it is essential for economic growth, quality of life, social equality, and environmental protection. This further accelerates the rural reliance on personal vehicles, reducing opportunities for citizens without their own transportation. Subsidies can lead to an inefficient transport system as they are allocated regardless of customers leading to unmet demands, uncoordinated and poor promotion (Mounce et al, 2020). It can occur that different organisations may be operating at the same times and places for different trips which is costly

and inefficient. This can be reduced as with more information made about travel demands more informed policy and operational decisions can be conducted.

Frameworks were also examined in the provisioning and regulation of rural mobility. How they contribute and how they create barriers. There is a near total absence of specific policy for mobility across Europe (Mounce et al, 2020). This is due to lack of directives, strategic policy making and planning. The Smart Rural Transport Areas (SMARTA) project was introduced which asked 10 questions on which a cluster analysis performed which categorised them into 4 distinct clusters. When investigating good practice which had taken place themes were highlighted such as partnerships, community engagement, use of ICT and stakeholder communication were key to success (SMARTA, 2021).

2.4.3.2. Housing Policy:

There have been instances of policy not being implemented effectively for other drivers of economic growth such as housing examined by Gkartzios & Scott (2009). The research examines the Rural Renewal Scheme (RRS) and its effectiveness in Ireland. The scheme introduced fiscal incentives to subsidise construction and renovation of and business premises in the Northwest of Ireland to suspend the level of population decline. The scheme was successful in its aim to halt population decline while increasing housing output but overall, the project displayed negative aspects as the excess housing number rising vacancy rates and issues with managements maintenance of the houses.

The issues came from rural governance, housing policy, planning and property led regeneration strategies. The research explored that the RRS did not allow policy to shift from governance to government implementation. This was due to regional regions with limited finance and administrative resources still subject to a top-down policy approach which due to a broader outlook at national level fails to recognise a regions unique set of spatial and socio-economic characteristics.

Additionally, there was no shared strategic vision between the rural renewal scheme and national policy on rural housing and planning. Both initiatives should have worked mutually to obtain optimum results which may have led to sustainable economic growth for the region. The number of houses may have been reduced if the RRS had been more closely targeted at individual districts or sites identified in consultation with local authorities in the region at the program design stage using integrated area plans. This demonstrates that policy needs to be examined and studied on a local or regional level as without the additional, *'eyes and ears'* the capabilities of regions may be overlooked leading to a reduction in opportunistic economic growth. This concept of policies and initiatives working exclusively needs to be examined as the benefits can lead to an enhancement and transformation of regions.

This has been examined further by Gkartzios & Scott, (2013), which analysed the disconnect between housing and rural development research. Rural development is examined within the housing context with analysis of planning and rural development policy and research in Ireland. The research examines external tax break provisions for housing construction has been associated with excess housing supply in the northwest, prominent levels of unfinished houses

and mismanaged public expenditure. Internal examples of housing policies which sought to prioritise local housing needs has been criticised for furthering a clientist system of local governance, contributing to unsustainable rural settlement patterns. This also has associated environmental, social, and economic costs while also introducing inequality of access to rural housing by distinguishing between locals and non-locals.

Both models have failed to secure sustainable development of rural communities and economies due to rural polices operating in parallel rather than forming distinct and separate approaches. They are unique to the rural context as in urban areas they were led by enhanced government mechanisms or non-existent. The research highlights the increase in neoliberal ideas, policies, and projects to the unfolding of social and spatial life in rural areas. The research quotes (Ray, 2001), to call on a hybrid model between the two which goes beyond internal and external modes by focusing on the dynamic interactions between local area and their wider political and other institutional, trading, and natural environments.

The research discusses Ireland and its history in housing from the mid-90s which has led to in migration and expansion of the population resulting in people moving rural to as opposed to urban centres. The patterns in rural regions are generally self-build and self-developed housing on land owned by family networks which increases the social and community bonds. This can create barriers for people with lower social connections and family land resources. The access to land emerges as a major driver of household locations as opposed to proximity of amenities. The supply of local housing has been categorised as self-build single dwelling, developer led speculative housing developments and developer led speculative apartment developments.

Increased housing supply from the boom, this was a period which was led by high demand and low supply of houses with inflated prices being sought for these properties. This led to people purchasing properties as an investment hence obtaining holiday homes in rural and coastal areas of the country. The research notes another academic, Scott (2007) which argues the rural housing debate is characterised by conflicting constructions on reality. These are conservation interests, planning officials favouring restrictive policies to address the impact on landscape groundwater pollution, reducing car dependency, containing urban sprawl, and managing public spending by providing infrastructure in rural areas. The other side there is community development interests and councillors who favour more relaxed policies to enable greater social vitality, economic activity and protect the loss to rural services.

Recommendations of the benefits in adapting a neo-endogenous approach mean extra-local factors are recognised and regarded as essential but which retains the endogenous belief of the potential of local areas to shape their own future. This balances local needs while competing for additional local resources of social, political and financial which provide key resources for rural development. While placing housing within a rural development framework attempts to move beyond short-term politics toward developing an appropriate model of housing supply in rural areas. This model would allow for top-down programs meeting bottom-up approaches, state intervention would also be encouraged in this model for the provision of housing. This neo-endogenous housing development requires addressing local regulatory needs while attracting additional residents, resources, skills, and capital. Urban generated rural housing consumptive pattern in rural areas can be viewed as unsustainable. It also suggests that housing policy should

be placed within a multi-scaler and multi-sectoral governance arrangements. For example, connecting housing developments with wider rural development and economic regeneration strategies. This can ensure that local needs are balanced with wider strategic priorities and to ensure that local demands for housing are considered in the context of regional housing and labour markets and models of rural service provision. It also illustrates the rationale for exploring inclusive storylines of sustainable rural development. The Irish case of rural housing clearly identifies the need for housing policy to be evidence-based in that it reflects the reality and diversity of rural mobility. Furthermore, it notes there is a challenge to explore how rurality is constructed as 'local,' 'authentic,' 'vernacular,' or 'regulation-free' in the housing context. Inclusive deliberative models of policy making would enable rural stakeholders to explore various narratives of rural sustainable development while promoting rural citizenship. The approach also provides rationale for inclusive models of housing supply including the provision of social affordable housing and mixed tenure in the rural context. This neo-endogenous housing approach could challenge the monopoly of homeowner occupation and contribute to the social and spatial balance of rural settlements through affordable housing schemes, mixed tenure developments and community led initiatives and ownership.

2.4.3.3. Digital Capabilities:

Salemink et al. (2017) explored digital and rural development to understand the impacts brought upon by the Next Generation access revolution. The research displays there is persistent and growing differences in data infrastructure quality between rural and urban. It explained how public policies are outdated regarding market developments and how the lower level of skills and education in rural regions have led to a lower adoption of these policies. It notes how peripheral regions should be the ones with improved technology as being most remote. The research conducted discussed connectivity and inclusion which touched on several common themes. The underlying message from the research was all households must have strong broadband to progress and the education to utilise the more efficient infrastructure. By not developing and training the locality will further the digital exclusion of peripheral regions thereby increasing the economic decline. Another issue is telecommunication companies lack desire to invest in rural regions as the investment is not feasible leading to an enhanced price to establish a network in rural as opposed urban area, hence furthering the digital divide. The research also acts as a guide to policymakers of the benefits of having fast internet on productivity and regional growth. Policymakers should customise polices based on local stakeholder offerings to improve the regions capabilities. Criticism has been given to state agencies who by leaving it to competition and the free market has meant they have less influence in the region. Secondly telecommunication companies will only serve where profitability is at its highest which leads to rural regions receiving minimal services and trainings at a time when it is already outdated to what is being offered in urbans regions. This further increases the digital penalty for rural areas which if handled correctly with state support could have led to them being the most advanced and creative in terms of opportunities, employment, and increased foreign direct investment to the region.

Huggins & Izushi (2002) examines digital divides and ICT learning in rural communities through exploring good practice of service delivery. It reviewed rural dimensions of ICT learning including a range of initiatives and programmes. These activities included:

- Practice opportunities in ICT.
- Video games and internet cafes being used as entry tools to remove the barriers.
- ‘User management’ to create ownership.
- Service delivery beyond fixed location.
- ICT capabilities in delivering general solutions and selected use of financial support.

The research examines similar factors as Salemink et al. (2017) in the growing divide which is evident between rural and urban and the implications of this. The research notes how without ICT it can deprive individuals to fully participate in the local and national economy. This lack of ICT literate employees’ leads to businesses being unable to participate fairly in a competitive marketplace.

The UK is noted as where there are significant differences in ICT between the core and peripheral regions of Wales, Scotland, Southwest, and Northwest failing to make use of ICT capabilities available which further hinders their ability to work within the information age. The research calls for strategies to be implemented to tackle the growing uneven development and

concerted efforts to build the capacity to utilise ICT in rural regions. Huggins & Izushi (2002) discusses the UK Government initiatives the Information Society programme and 'IT for All' initiative (Huggins & Izushi, 2002). The Government also published studies on how ICT can facilitate improved economic development practices and local initiatives have emerged to facilitate the skills development in rural communities. It also notes how rural regions are the most vulnerable as they are already isolated and dispersed with weak transportation infrastructure causing social exclusion as places of opportunity is inaccessible. An additional obstacle is rural businesses are less innovative and slower to adapt to innovative technologies than in urban locations. This is strengthened by the industries which they may be in. Rural businesses may not have fully adapted ICT into their activities, have fewer opportunities for cross collaboration with other businesses and in just trading locally they lower their propensity for ICT awareness. The further implications of this being a 'teach-your-self' practice is that formal training is restricted due to remoteness and reluctance of business to up train employees.

Three sets of criteria are identified by Huggins & Izushi for delivery of ICT learning:

- Demonstration effects within rural communities provides access for the 'transport poor' and the use of ICT capabilities in the delivery of more general programmes and services to develop an understanding of wider potential ICT
- Innovation centres are an important way to deliver the benefits of ICT and provide the components for people to be comfortable in ICT. For its success there must be access, face-to-face meetings, learning support and relevant content.
- Videos Games, Internet Cafes were essential to reducing entry barriers and emphasis 'user management' creating a sense of ownership for individuals in their own learning process will encourage people to maintain ICT capabilities and serving the 'transport poor' with accessibility to workshops and training a principal factor.

An additional component of this research which is also evident today is peripheral regions paying higher premiums to access digital technologies. In Bosworth et al. (2016) it is referred to as the *'rural penalty'* while in the research by Huggins & Izushi, (2002) refers to it as the *'rural premium'.* Although the label may be different, the obstacle is not, and this remains an issue to date. It also notes, training provision programmes which are offered free of charge to the public and businesses at the initial stages of engagement, but the cost of additional further training can be an additional barrier for peripheral regions. The authors recommend the most effective ICT learning provision requires strategies that integrate the different programs into a coherent package at community level. ICT initiates should adopt a collaborative approach between organisations and through this open policy, inclusion of the community so to develop a sense of ownership for their own progression which are essential for sustainability to be achieved (North & Smallbone, 2004; Morrison, 2018; Autio & Levie, 2015).

In a modern-day view of digitalisation in rural micro-enterprises is conducted by Raisanen et al. (2020) which supporting the diffusion and adoption of digital innovations in rural micro-enterprises is examined. The research explored challenges and digital competence of micro-enterprises in rural Finland and developing a workshop concept which theories of diffusion and adoption implemented. It notes how the digital divide of rural and urban is still an issue with

problems even occurring in digitally advanced countries such as Finland with visible differences in quality of data infrastructure and average levels of education and skills (Salemink et al, 2017). The introductory section discusses issues which are not easily solved with faster internet technologies available which include the expense for rural areas and reduced options. This issue is noted as the 'Digital Penalty' and 'Rural Premium' by (Bosworth et al, 2016; Huggins & Izushi, 2002). Although it is over 14 years between these research papers it is still alarming to observe that these are still prevalent issues for Peripheral Regions.

Global competition is increasing, and the slower internet connections of rural regions may result in a loss of competitiveness. Additional challenges are regions digital competence. Digital innovation is defined from (Popadiuka and Choo, 2006) as innovation that combines digital and physical components to create a new product. Reducing the digital divide is only possible by considering technological, economic, and human factors offering just the technological aspect is not enough. The human factor means knowledge information needs to be offered with an approach that considers the learners and helps them grow their skills and competence while the economic factor is the cost of obtaining broadband rurally.

2.4.3.3.1. National Broadband Plan:

Digital capabilities have been an issue for rural regions for a considerable time with the digital divide only becoming ever more visible with the implications brought on by Covid-19. From the beginning of the pandemic there has been a significant rise in remote working in response to businesses adhering to guidelines. This has been followed by a Remote Working Strategy published by the Irish Government which would aim to make remote working a permanent option for workers post-Covid. The new legislation will allow employees the right to disconnect and request to work remotely. This will additionally aim to accelerate the National Broadband Plan as Covid has further highlighted the importance of broadband capabilities for keeping people connected to each other, their work, education resources, business needs and entertainment services (Government of Ireland, 2021). By advancing this broadband infrastructure and with this surge in remote working it may act as an incentive for people to relocate rural as opposed to urban.

The National Broadband Plan (NBP) is the governments initiative to deliver high speed broadband services to all premises in Ireland to ensure that no-one is left behind and everyone can progress together. This will be a collaborated effort through investment by commercial enterprises and intervention by the state for parts of the country which there had been no previous plan to invest. The NBP is a key aspect of government strategy across several areas including climate, agriculture, education, transport, tourism, sustainable growth, jobs, and health. The strategies key principle of the NBP is to support and stimulate commercial investment. This strategy has also been approved by the European Commission of EU State Aid rules (Government of Ireland, 2021).

There has been infrastructure invested in the types of area which Páirc Na Mara is envisioned. These types of innovation hubs known as *'gteic'* are a network of 30 innovation and digital hubs which will be established throughout the Irish Gaeltacht. These innovation hubs will serve six Gaeltacht islands and seven non-Gaeltacht islands which will be an integral part of the digital

ecosystem to support sustainability. These hubs have desk facilities and shared spaces for remote and computer workers with fully equipped office space and incubator units with high-speed internet access to facilitate innovation and concept development. This type of iHub has also been developed at Galway-Mayo Institute of Technology to drive the enterprise model of market-led and knowledge-based industry development (GMITiHUbs, 2021).

2.4.3.3.2. Digital Agenda:

Raisanen et al. (2020) examines the European Union Digital Agenda for Europe (DAE). This involves for all Europeans by 2013 to have basic broadband and in 2020 to have a fast connection with half of Europeans to have access to ultra-fast broadband connection. This first objective is 97% complete including 90% of rural households but the divide becomes evident with faster broadband connection. Romania, Sweden, and Latvia are the most advanced with a 40% ultra-fast connection. 79% of EU citizens use the internet once a week with Northern and Western parts of the EU using the internet more than in Southern and Central eastern parts of the EU. The main reasons for not using the internet are the lack of internet access and the lack of skills. This can be accredited to conditions of internet access, internet use, technologies, ICT skills and motivation. This lack of skills can lead to further repercussions down the line as government aids are applied for mainly through web-based services. This has led to a further digital divide for Finland where a lot of businesses lag using e-commerce. Digitalisation of companies in the EU is supported by EU project funding, the digital path is a type of EU funded project which was developed to support the exploitation of digitalisation in micro-enterprises in central Finland.

In the EU fixed and mobile broadband is not evenly distributed with a digital divide persisting across Europe. Small and Medium Enterprises (SME) have more difficulties to fully engage in the digital transformation than bigger enterprises which is due to having less invested in digital technologies and the transformation (Ben et al, 2017). Digitalisation of companies in the EU is supported by EU Project funding, Digital Path is a type of this EU funded project. This workshop concept was developed to support the exploitation of digitisation in micro-enterprises in central Finland. The University of Jyvaskyla coordinates the projects workshops for companies which covers the digital themes of web stores, digital customer management, web pages and search engine optimisation. *280 organisations participated in the workshops most being micro-enterprises* (Salemink, 2020, P60). Challenges for the business included lack of purchasing power, finding new customers, aging of population, outmigration of young people, access to skilled labour and the lack of understanding of ICT benefits. There is a fear of change but by educating the potential of e-commerce and international opportunities this may be overcome. In coordination of the workshop, it was assured to make it easy come by and accessible to rural regions while having it perceived as useful and easy to use. The effectiveness of the workshop which was conducted had 266 from 474 saying they benefited with 176 saying they benefited a lot. Digital marketing was found as the most interesting topic for businesses. The key elements for supporting diffusion of digital innovations in micro-enterprises are communication, opinion leaders, change agents and trust. Ben et al. (2017) has estimated, *'by 2020, 90% of jobs will require some digital skills'* (Ben et al, 2017, P41). If the digital divide continues to grow and ICT

capabilities are not advanced in these regions it may be detrimental and should be viewed as a critical issue.

Hasche et al. (2020) discussed a solution to a rural issue which was that if peripheral regions were to get connected it could increase their level of competitiveness and would allow for the regions to play a role in larger innovation networks. It discusses how *'soft infrastructure'* for the helix models such as networking and collaborating can enhance the Regional Innovation System which can increase collaboration between counties while also linking up the innovation support system with incubators and science parks. This as a collaborative platform has generated new products and firms, connected stakeholders from industry and academia and placed government as a central actor in the commercialisation process this provides more value-added activities to society in a quadruple helix perspective (Hasche et al, 2020).

2.4.4. Social Innovation:

On investigating social value being created through innovation, Bosworth et al. (2016) identifies social innovations in European rural development initiatives and their implementation in rural communities. This type of knowledge transfer is launched by participants in a community who identify the need to modernise their locality by utilising resources creatively to achieve enhanced value. This array of innovative ideas which meet social needs more effectively than what presently exists can lead to new social relationships and collaborations (Murray et al, 2010). The research explores the need for 'social' processes involved for innovation to create these incremental changes to the rural context.

Bosworth et al. (2016) identifies how being cohesive and sociable are characteristics of a rural landscape and how through these dynamic interactions between stakeholders can lead to innovation and opportunities. These drivers of rural change can be both internal and external which make the interfaces between local, extra local, top-down, and bottom-up particularly applicable. This is quoted in the research from (Dargan & Shucksmith, 2008). This has all been linked to neo-endogenous development which involves the creation of local connections and a common learning culture. An economistic approach to social innovation is needed with a want and platform to accept changing attitudes to aid new relationships for the social innovation to prosper (Bosworth et al, 2016). An observation noted, is social change moving as rapidly as technological change to combat this the need to identify and understand these drivers is essential for social innovation. Following on this research it adapts an analysis of exiting datasets compiled by the LEADER Programme. The term innovation is identified as a leading pillar behind the organisation but when delved upon further Bosworth et al. (2016) identifies a range of innovations which exist within the LEADER Programme along with the types of social innovations. LEADER has noted how any goal where economic growth is a primary concern there is always a social impact as cooperation and participation of people is needed.

Rennie et al. (2016) examines international best practice in service delivery to remote and rural areas. The research examined several case studies from Europe, North America and Australia which would identify practices which may be transferable to Scotland. It became evident that with a few key factors in place can increase the level of success which rural areas can possess.

Community survey techniques, local consultation and open involvement planning were vital for the regions to create growth and opportunities.

Common factors which appear in rural regions for best practice to occur were:

- Establishment of formal partnerships between various stakeholders provide the best platform for innovation and local entrepreneurship.
- Open involvement in the planning process for the design and implementation.
- Strong connections to support local demand.
- Upskilling opportunities which identify local ownership.
- Fundamental management.
- A physical centre which the service provision can be supported.

These are all prevalent factors which have been noted in research literature surrounding innovation centres and revitalisation of peripheral regions. The research also examined the high-tech and low-tech solutions to address peripheral issues. Low-tech can include population density, difficult topography, economies of scale, partnerships to share equipment, accommodation, and staff. High-tech included delivery of education to remote sites, experimentation of telemedicine techniques for people living remotely and application of transaction facilities (Rennie et al, 2016). Scotland has had a division perspective between voluntary or community provision of services, delivery of services and the range of services offered by entrepreneurial operations. Rural regions have aimed at achieving economies of scale, promoting collaboration by fostering multi-purpose service centres. In Rennie et al. (2016) eco-tourism and cultural tourism were benefiting from ICT. The research then explores five different case studies and what adaptions were made to increase rural opportunities. In Australia Rural Transaction Centres have been developed to provide rural communities access to government information and services, private sector services, products and office space for community uses (Rennie, 2016). The aim of the centres is to improve access to basic needs of specific communities. In Canada, Hants County Enterprise Centre provides a base for several agencies providing employee assistance, business counselling, computer training and workshops to further members of the localities own personal and career development. The centres aim is to work collectively and build on the strengths of the community. The Legal Aid Queensland initiative was a collaboration between three initiatives to improve access for residents in Queensland to legal information and advice with the aim of providing access to justice for rural communities. The Local Community Net in Finland was a pilot project to encourage the establishment of community network based on computer conferencing, email, and web-based communications. The project has social objectives to prevent social exclusion, support social innovation and improve services and living conditions in the pilot area. It had a firm focus on knowledge sharing, employment creation, vocational training and local authorities making information available through the network. The final study examined was Multi-Service Rural Shops in Europe which provide a range of quality goods and services for the population of the locality. It leads to enhance the quality of life, discourage rural depopulation and to improve employment and economic diversification. They provide a combination of rural services, but the support framework and promotion are an essential element.

The concluding comments note that for rural innovation and growth opportunities to occur collaboration among stakeholders needs to occur. The centres when developed must have an offering for the locality. A technique which implements this is by utilising the centre as a focal point to disperse information to the wider locality, align different agencies and initiatives. The centres when developed in these peripheral regions must have an offering to people in the locality. A technique which has been followed is by utilising the centre of focal point to disperse information to the wider locality, align the different agencies and initiatives and offer workshops and training opportunities. Although this research acted as a comparative study in relation to Scotland, it does act as a framework to what should be offered in peripheral innovation centres to assure their sustainability. This includes offering supports, collaborative workshops, knowledge transfer and training opportunities. This needs to be followed under a collaborative framework with all agencies working in alignment to assure aims and strategies of the innovation centre are achieved.

Steiner (2021) discusses rurality, social innovation processes and outcomes while carrying out interviews with beneficiaries, service providers and external stakeholders of a rural enterprise in Scotland. The process of social innovation has been widely encouraged by policymakers as a process for peripheral regions to enhance the quality of life for its residents. It notes how peripheral regions have factors which would allow for social innovation to thrive which they credit to important levels of social capital, cohesion, embeddedness, mutual knowledge among members acting as a stimulant to social innovation helping to address economic challenges and geographical disadvantages.

Technological innovation changing socio-economic and political contexts and globalisation have transformed how rural locations operate which influences the lives of its residents. The characteristics which most rural areas have are an elevated level of social cohesion associated to self-help and civic participation (Farmer et al, 2008). From this sense of community there is an enhanced trust which allows for the residents to have more comfort in participating in collective activities to create opportunities and social enterprises. The drawback of living rurally is noted as outmigration, dispersion of its citizens and difficulty attracting skilled labour, challenges which were also identified in (Suorsa, 2007). These limitations can restrict businesses being able to participate in economies of scale leading to a reduction in profitability and investment. These implications can decrease public spending which creates a barrier to local development and social interactions (Steiner, 2021). The research notes a direction which rural, agriculture and fishing towns are directing toward is that of a commuter town, a place to retire or a tourist destination (Skerrat, 2012). Spin-off issues from economic downturns, health pandemics, ageing population, public spending cuts and climate change have all had severe issues for peripheral region which has created new challenges. The European Commission define social innovation as “innovative ideas that meet social needs, create social relationships, and form new collaborations. These innovations can be products, services or models addressing unmet needs more effectively.” The European Commission's objective is to encourage market uptake of innovative solutions and stimulate employment (European Commission, 2020).

Steiner (2021) research explores a social innovation, Active Life in Scotland. This social innovation adapted a collaboration between the local medical centre, the physiotherapy and diabetics departments of a local hospital and another well-established community organisation within the region. The initiative provided classes and tailored services to people suffering from a chronic condition. This initiative was chosen as it was a partnership between social enterprise and the public sector created to address health challenges in the region. The study had three themes: developing new social innovation initiatives, increasing embeddedness and social cohesion inside the initiative and the third relating to rising reciprocity collective activity and social capital in the community.

It is noted that a lack of services can trigger rural communities to develop new services and address local challenges through a social innovation process. The fit-for-purpose intervention was proactive as it engaged actors to better understand the needs and potential solutions needed. The *'needs based care model'* was the ideal solution for the community as it identified local needs and supports needed to implement an innovative solution. Additional themes examined the level of community which increased through the new enhanced quality of life from the initiative. It also noted how social networks led social innovation to create relationships within and between different community actors. Push factors born out of necessity lead to reactive social innovation while pull factors derived through harnessing perceived opportunities in the environment lead to proactive social innovation. A collaborative geographical space is essential for social innovation, with place and time important drivers and influence how a social innovation is initiated and implemented which can also be a factor in the social innovation being successful in its outcomes (Steiner, 2021).

Social innovation governance and the role of universities is examined through quadruple helix partnerships in Italy by Bellandi et al. (2021). The research notes a growing number of scholars are associating the concept of social innovation with the quadruple helix model. Social innovation is defined to be the result of an interaction between different societal sectors working toward systematic change (Howlandt et al, 2016). The research explores the lack of understanding concerning how collaborations are carried out in multi-actor partnerships and the institutional barriers, conflicts of interest and misalignments which may arise and have been noted from other authors (Bellandi et al, 2019; Selada 2017). It also addresses which mechanisms foster or impede the governance set for social innovation and the role which universities play, their contributions and partnerships. The research conducts a similar observation to Steiner. (2021) which it notes the challenges facing society as climate change, population, ageing, income equality and social exclusion. In exploring university and public and community engagement for social innovation the research displays that for decades' universities have promoted the idea of technology transfer activities with an aim for more socially inclusive goals with the institutionalisation falling under the fields of 'public engagement' and 'university community engagement' which has led to it being increasingly focused on knowledge co-production.

A conceptual framework was developed which aimed at noting the presence of factors of conflict and barriers. A preliminary factor of strength existing in a quadruple helix partnership can be one

of a mutual understanding between them or as the research refers to it as *'identification of the common nexus amongst actors.'* (Bellandi et al, 2021).

- The first stage is to find a common nexus which may be cultural, cognitive, or motivational.
- The second stage is building a strategy within the partnership.
- The third stage of implementation, the university can contribute with different resources and functions.

The approaches of community engagement may help where the university contributes as one of the actors that with community partners is able to produce knowledge. In case studies analysed of North, South and Centre of Italy they all confirmed that for the quadruple helix to operate efficiently a common nexus plays an essential function. The projects relied on mutual trust and understanding among the stakeholder from the beginning of their set-up with a consequent aptitude for building shared strategies. In applying the implementation phase there was technical and procedural barriers in all the case studies which disrupted the timeline. Universities are noted to not only provide specific knowledge but also to act as mediators between the different knowledge fields, interests and agendas that feature in community-based projects among diverse types of actors. It has been noted by academics that quadruple helix coalitions may suffer from divergent objectives, interests, and agendas due to the different nature of actors involved (Bellandi et al 2019; Selada, 2017). (Bellandi et al, 2021).

Key actors in community-driven social innovation in rural areas in the Nordic countries is further examined by Junsberg et al. (2020). The research examined 18 community-driven social innovation projects and identifies the importance of varied factors and stakeholders in the initiation and implementation processes for these projects. Nordic countries have had issues with population decline which can distort the age, gender, and socio-economic balance by an outward migration of young, well-educated, and economically active people living in rural areas (Grufender et al, 2013). Additional issues are a reduction in funding for rural areas furthering the rural-urban divide. Social innovations have been developed to combat these challenges. The comparison between social innovation and rural development is social innovation needs to be perceived as novel by the community involved in its creation noted by (Neumeier, 2012). Social innovation has been studied empirically and theoretically as a driver of social change. From this the research examine social innovation initiatives and how they had been triggered by regional vulnerabilities which can include demographic shifts and challenges. This is a similar challenge faced in Scotland by Steiner (2021). This can begin with an initiation stage which involves starting up a new service or activity. Civil society with the local public sector is the most important during the initial phase as it allows for engagement with the most important connections. Ideas for the initiation phase will come from individual community members. The local public sector was the most engaged actor in the idea generation phase. For all projects, a supportive attitude for growing new projects is vital in the idea and development phase. Resources needed for the initiation phase were noted as knowledge, networks, funding, and volunteer labour. Resources may also be obtained through voluntary and charitable fundraising,

public sector grants, fees charged for memberships or fees paid for services such as consultancy, catering, cultural activities, and events (Junsberg et al, 2020).

Decision-making is discussed with civil society organisations involved with key decisions which community were involved with until a local project manager led the innovation. To emphasise the social values profits should be reinvested to increase the social value in the area. An example of this in action was in Northern Norway where a company built 36 homes for disadvantaged people and refugees followed by the creation of a cleaning company which provided 6 refugees with employment. Other decisions made involved the legal entity which the social innovation was established so support could be identified to implement the phase of the social innovation. From the implementation phase there is a substantial shift in the actors who contribute. There is an increase in the role of society and the private sector these may be the same actors, but the nature of their involvement changes due to either the establishment of civil society organisation or that of a social enterprise. Idea generation changes from finding solution through innovative ideas to solving day-to-day problems. It is at this point a project manager is crucial to plan, guide and support a well-designed and well-structured approach to the implementation task. It is important the social innovation fully established itself with a key capability to communicate the contribution of social innovation by developing ideas for good and effective outreach stories. Ideas generated may include innovative approaches to establish platforms for collaboration. Most social innovation projects depend on multiple sources of income and diverse economic activities which can include membership fees combined with annual public sector grants. From here, decision making by the public is reduced. The results show that partnerships reaching beyond the community interacting with many actors are important when it comes to reaping the full benefit of social innovation (Howaldt et al, 2018). In most examples the actors involved in the process display a similar trend toward engagement and the local authorities provided a supportive environment through education and training with the aim being to upskill local people and provide access to spaces and infrastructure which include youth and community centres. This type of process can help secure the legitimacy of the initiative, build a broader capacity and help the regions thrive in the long-term. Junsberg (2020) notes it is crucial to build up broad, local capacity to ensure that social innovations continue sustainably long-term.

2.5. Lessons from the Innovation Centre Literature:

This section will examine innovation centres and their role within creating growth for peripheral regions. This section of this research paper will examine innovation centres and their role within creating opportunities and growth for peripheral regions. Páirc Na Mara will be a marine innovation centre situated in a disadvantaged peripheral region in the West of Ireland. It is important to identify the requirements needed to assure its sustainability while also identifying the relationships and platforms needed to continue to create opportunities and further employment for residents within the locality. This section explores the concepts of *'Knowledge Transfer Collaboration,' Spin-out Enterprise' 'Knowledge Clusters,'* and *'The Triple & Quadruple Helix Effect*.' These themes were selected as they were the most prevalent in the review of the literature, which explored economic growth among regions. In most of the literature for innovation and idea generation to occur, a level of knowledge transfer among stakeholders had to be evident (Morrison 2018, Hasche et al, 2020). In this research, this is further enhanced by the number of stakeholders involved i.e., having a Triple/Quadruple helix platform for innovation. From the success of these interactions and shared knowledge and capabilities, spin-out enterprises were able to start-up further enhancing the regional reputation for product generation and economic growth.

2.5.1. Knowledge Transfer & Collaboration:

The vast amount of current literature relating innovation centres and rural entrepreneurship indicates to knowledge transfer as an integral feature in achieving idea generation and job creation (Walsh, 2019; Morrison, 2018; Ryan & Giblin, 2012; Giblin, 2008; Ali et al, 2020; Hasche et al, 2020; Autio & Levie, 2015). Numerous studies have accredited this freedom of interchanging networks amongst key stakeholders being crucial to a successful knowledge crossover and has been positively discussed by various academics in their research. Throughout this segment *Knowledge Transfer* will refer to the transferring of knowledge between key stakeholders such as Industry, Academia, Government and Community with the concept being described as an essential lead to innovation and entrepreneurship.

Autio & Levie, (2015) examined how vital knowledge transfer is for entrepreneurial ecosystems. These are described by (Cavallo et al, 2019) as peculiar systems of interdependent actors and relations directly or indirectly supporting the creation of growth of new ventures. The research explains for business to organically grow and stimulate opportunities stakeholders must participate in collaboration with success being achieved through avoiding misalignments with mediocre entities. This may include forming partnerships with business who do not share the same vision or hold the same drive and determination to create new innovative products and services. By misaligning it can lead to a business being unaware of its own capabilities leading to a further reduction in spinout enterprise hence further increasing the *'entrepreneurship bottleneck'* within that region as firms do not identify new markets or services leading to a limitation in capabilities and entrepreneurial opportunities for that locality. The ideal ecosystem model for knowledge transfer to occur is one large enough to be self-sustaining while also being of scale that stakeholders involved know each other (Autio & Levie, 2015). Shared vision and collective action are created through stakeholder participation and engagement.

Ali et al, (2020) explore how conditions in the external environment are associated with market-driven and corporate entrepreneurship. The paper explores whether these types of diverse entrepreneurship are associated with innovative but not with opportunity driven entrepreneurship. Strong conditions for innovation show negative relationships with both innovative and opportunity driven entrepreneurship while corporate can thrive under all three conditions which are basic institutions, market efficiency and innovative contexts. By improving the basic institutional and market context these can include education, financial, legal systems and physical infrastructure which can make up the socio-economic foundation and can enhance innovation entrepreneurship. From an opportunity cost perspective there is more incentive to operate within an institution from these established organisations are more likely to reap the benefits of national efforts to enable activity. An additional condition noted is technical conditions from (Scott & Meyer, 1983). These are conditions central to business activities and can include investment into R&D, collaborations and research institutions by contributors which can create new technological knowledge. It discusses that market driven entrepreneurship is valuable in a society in providing business opportunities for gaps in the market and unique products and services for customers (Fairlie & Fossen, 2018; Galindo & Méndez, 2014; Simón-Moya et al., 2014).

The difference in a nations government is explored and what activities it promotes from (Galindo & Méndez, 2014). Innovative entrepreneurs thrive under conditions of higher quality institutions and market efficiency, but entrepreneurial individuals will obtain opportunities regardless. It also finds that market-driven entrepreneurial behaviour is lower in environments which foster innovation which may be due to established enterprises prospering from these benefits (Ali et al, 2020). The research notes that it is imperative to identify these three types of entrepreneurships of opportunity-driven, innovation based and corporate entrepreneurship and the interplay between them and the environmental factors that foster them. Another factor is it may be more attractive for individuals to become employees and participate in innovation within a company as opposed to taking the personal risk. McMullen et al (2008) is noted in the literature that lower level of entrepreneurship may be due to rising opportunity costs associated with more viable employment options which corroborates literature from Bruhn (2013) which suggested that improvements in external conditions lead people to prefer work as employees which Ali, Kelley, Levie, (2020) add may also encourage intrapreneurship. The results note policymakers need to be cautious to who they wish to encourage as investment in innovation may only benefit corporate entrepreneurship as opposed to innovative start-up activity due to the associated risks. The process of attracting and enabling employees to develop new products and services will become vital for corporate survival. (Ali et al, 2020).

2.5.2. Spin Out:

This type of enterprise start-up has been examined by Walsh, (2019) in which he discusses that a considerable amount of an individual's development and acquired skillset are derived from their past employment and that academia has a vital role as enabler in creating a network for growth and entrepreneurial activity within rural regions. This type of enterprise has been noted in a vast amount of literature as key to regions creating economic growth and has been evident in different knowledge clusters. This is most evident in Galway in relation to the medical device cluster,

which is discussed by Giblin, (2008) & Ryan & Giblin, (2012). It is also seen occurring in Robotdalen by Hasche et al. (2020) and in the type of enterprise which most likely may start-up when a successful triple or quadruple helix is implemented as seen in Morrison (2018).

From working within a highly skilled technological role, the skillset developed can be transferred to a new setting or to establishing their own enterprise. These types of intangible skills which have been developed by working in high-paced environments which 'timing' is one the highest importance. This is in contradiction to an academic circumstance to which there may be no immediate circumstance for substandard timing or failure to achieve the desirable results (Walsh, 2019). A fault in engaging in this 'spin-out' culture may be that larger established enterprises may hold a substantial percentage of the market share meaning it may be more difficult for new firms to operate competitively. A concept which may be explored is to push knowledge transfer within stakeholder groups from individual to individual but to utilise the network enabled by academia. This would enable a platform to bring this industry and taught knowledge to the forefront to create a new type of technological product. This transformation is also evident in Ryan, (2012) in which he delves into how Ireland has changed from a craft society to a high-tech manufacturing. The investment made has led to further foreign direct investment and allowed a regional change to a smart economy and of workforce capabilities. This can enhance operating methods, systems and trainings further enhancing our reputation as a location to conduct business leading to a sustained level of economic growth for the region.

2.5.3. Knowledge Clusters:

A type of knowledge transfer led by inward foreign direct investment and the clustering process, in the medical technology sector has been explored by Giblin, (2008). The research examined the development of a medical technology cluster located in Galway in the West of Ireland. The research was conducted with 15 firms both indigenous and foreign owned companies which examined company background, innovative process, markets and R&D activities, external linkages, and reasons for locating in the region and future growth of the firm. Galway has become one of Europe's leading industrial clusters which the research references noted by (Brown, 2005). The regional specialisation came about from the establishment of foreign-owned operations that were attracted to the region due to tax incentives, financial packages, and available labour. Two of the world's top medical technology firms are now creating the most employment within the cluster. From this an indigenous base of smaller-sized companies have emerged which are providing ancillary related products. From this growth, the National Centre for Biomedical Engineering Science (NUIG, 2021) was established at the National University of Ireland, Galway (NUIG) in 1999 which engages with research activities with these firms. There have also been courses developed to meet the specific labour requirements of the medical technology firms.

From the interviews conducted all the companies engage with distributors, strategic partners, and other company offices globally for the products to reach the marketplace. Often the highly specialised material and components are sourced from abroad and lower value-added activities are accessed locally. All companies involved reported to have formal and informal linkages with the local universities. This was through science and engineering departments which it notes that

collaboratively aligning with international universities and research centres were critical for at least three of the companies interviewed. They have research centres of expertise which the firms can develop R&D activities and a leading clinician and cardiologists associated with them that provide access to the end-user for the firm. There is enhanced regional benefits from being situated within a region with a strong knowledge transfer environment. International actors are drawn to the region which facilitates local firms establishing global linages. The high focus of medical technology activity in the region has led to leading international tradeshow conferences taking place which provides companies the opportunity to highlight their products and build new relationships for firms in establishing global connections which produces positive overall effects for the region (Giblin, 2008). Conferences were noted as the primary mechanism for keeping informed on technological and industrial developments in the sector. They act as opportunities for networking, displaying products attracting attention to the company, marketing observing competitors, finding suppliers and potential partners. These facilitate vital end-user access for the companies.

Giblin (2008) explores the evidence of start-up companies emerging in the region because of the multinationals employing a transfer of knowledge from experience to new companies. From the survey results from the five small enterprises, three had been founded by former managers of the large multinational in the region. From these managerial position's links can be created with specialists and other leaders allowing for feedback from international experts. Other types of knowledge transfer have been indigenous firms becoming more specialised in medical technology and cease production in electronics and metal work all from building the knowledge base from interaction with multinationals. The multinationals have also provided a pathway to international markets. Another survey indicated that there is a high degree of interaction and learning between the local supplier and the corporation which allows for expertise in the region that can be applied to projects with other companies. The rise in the standards required due to the product being sold internationally also enhances the capabilities of the region which can provide labour to the region which is important for potential companies. Another aspect of knowledge transfer is through collaborative involvement with academia which can involve sponsorships of PhD and master students which can increase knowledge flow within the region.

This is a type of coordination has been addressed in literature by Etzkowitz & Leydesdorff, (2012) in which the Triple Helix consists of university-industry-government relations. The research notes university can play an enhanced additional role in innovation in increasingly knowledge-based societies. The Triple Helix has changed the universities' role from a teaching institution into one combining research with teaching. The university now has a third role in regional and economic development because of the changing nature of both knowledge production and economic production. The universities unique comparative advantage is that it combines continuity with change, organisational and research memory with new persons and new idea through the passage of student generations. (Etzkowitz & Leydesdorff, 2012, P118). On discussion of society as the fourth helix it notes that society is no longer coordinated by a central instance but functions in terms of interacting among variously coded communications. These interactions can be expected to be both sources of variance (face-to-face communications)

and “structured” in terms of the different “horizons of meaning” being relevant for the interacting agents and institutions (Leydesdorff, 2012).

The topic of knowledge transfer within the Quadruple helix is prevalent in Hasche et al. (2020). The study discusses the Swedish case study of Robotdalen. The research investigates the process of adding the fourth helix to the model and how critical allowing this inclusion of civil society is to the development of that Regional Innovation System (RIS). Proximity is noted as a key factor when allowing for a knowledge transfer to occur as the innovation process can be difficult to transfer to other locations (Asheim and Isaken, 2002; Li et al, 2016). The civil society is essential for dynamic relationships, synergies, collaborations, coordinated environments and value-creating activities. It can consist of media, culture, and civil society. It is human centered focusing on democratic knowledge in favour of arts, artistic research, and arts-based innovation. A definition from (Carayannis and Campbell 2014; Payne et al, 2008) describe the process as the value creating process as a series of activities performed and resources combined by different actors to achieve certain valuable outcomes. Value creation is regarded as the essential purpose of different actors to engage in relationships. The knowledge transfer in a leading area like robotics has had an increase in job creation and relocation of firms to Robotdalen to be a part of the innovative hub. The example mentioned was multinational Giraff Technologies which relocated to Robotdalen in preference of Silicon Valley. The initiative aims to develop and strengthen the existing technological knowledge to create efficient structure where new products can be taken to market and new firms can develop.

The research from Hasche et al, (2020) also discusses the knowledge transfer which has occurred in Robotdalen with national, regional, and local government agencies and how through this process Robotdalen has enhanced innovation, created growth regionally and enhanced the value of three regional counties as they have begun implementing improved collaborative processes. It also explored additional work which Robotdalen has done within the industry segment of the Quadruple helix and how it has helped local businesses to create products and processes that without the added knowledge it may not have been applicable. An example of this noted was Shanska in where ABB a firm and Robotdalen collaborated to create an automation for building bridges. From this collaboration ABB later collaborated further in a robotic test centre and then located their centre there as it was described as a good environment due to its openness. This factor is essential in producing knowledge exchange between stakeholders within the helix. Robotdalen has been a collaborative platform within academia by allowing research to be conducted about robotics and automation in cooperation with Industry. These developments have also led to funding being allocated for large research projects with different industry actors. Management within the centre were looking for ways in which academia and SMEs could collaborate, one way to achieve this was to give students an opportunity to gain practical experience. This involved the students making the SMEs aware of the possibilities with robotics collaborating with the local innovation system on a regular basis to nurture an environment for knowledge exchange. This can be done through working with science parks.

Robotdalen has been recognised for creating a marketplace for robotic whiles its extensive network helps firms find relationships which can provide collaboration and knowledge transfers

(McAdam et al, 2012). Larger firms involved with the project noted platforms of this kind were essential for the quadruple helix while start-ups can benefit from learning processes through networks and relationships. This underlines the importance of having business development coaching and having a network of relationships to assist the commercialisation process. These research centres have also been able achieve higher results when working with industry.

Additional research by Ryan & Giblin (2012) examines high-tech clusters, innovation capabilities and technological entrepreneurship in Ireland. The study identifies the change which has occurred nationally both culturally and economically in replacing Ireland as a former craft society. This has been accredited to our policies and strategies in attracting multinationals through a lower corporation tax and grant incentives. The research also analyses the sustainability of growth in the economy and how it could be accurately measured if it has been led by Foreign Direct Investment as by implementing this can be difficult in creating a smart economy. Ryan & Giblin (2012) explores how the enhanced technological capabilities of the local workforce has been vital for companies establishing in Ireland. This includes examining the intangible capabilities of managing and supervisory roles which can be a deciding factor in the relocation of companies if they are assured there will be a prominent level of managerial expertise available. An additional aspect of this type of capability improving is ancillary firms providing to multinationals will adhere to international standards becoming more specialised These factors are essential to economic progression as from observation, as other companies may adapt procedures and management systems being used in the local multinationals leading to a restructuring of the region. A national example of this being implemented successfully is Galway in the production of medical devices which is on the same playing field as Minneapolis and Massachusetts. This alteration in regional capabilities and enhanced trajectory can inevitably lead to sustained economic growth.

2.5.4. Triple/ Quadruple Helix:

Morrison (2018) presents case studies in which innovation centres have been developed successfully. The research examined Station F in Paris, Rúta N in the Medellin and the Barcelona growth centre which noted how essential collaboration can be to give an idea motion and then to completion. The research examines how innovation centres have served to revitalise disadvantaged regions through various methods of entrepreneurship and job creation as part of the Triple or Quadruple Helix model. The Triple models consists of the stakeholders of Academia, Industry and Government while the Quadruple adds the Community/Society to the grouping. By these groups working in agreement, it can create an environment of entrepreneurship, knowledge transfer and idea generation. Factors which enhance the growth are attending of workshops, conference and showcase events held by other stakeholder groups. This collaboration between stakeholders is essential to incite innovation which can lead to knowledge growth and advanced social benefits and gentrification to areas located in proximity to the innovation centre which is evident in Morrison (2018) where the cities were given ‘Knowledge City’ status It is worth recognising the limitations of the research. Planners should be attentive and contemplative in pursuing this concept as a method to achieve job creation and regional growth. The locations of these innovation centres have been developed in regions with adequate levels of infrastructure in broadband, transport and housing and the population available to work in the region which are also advantageous in attracting foreign direct investment.

Knowledge transfer as a process to create economic growth and develop job opportunities is also found in research carried out by Soursa, (2007) which it is accredited as a leading impacting factor in the transformation of peripheral Nordic regions. Knowledge transfer has been achieved through implementing a Quadruple Helix. Garcia-Cortijoa et al. (2019) listed knowledge transfer as key to regional enhancement in which allowing for research centres and the location of companies in intermediate and peri-urban areas is a leading contributor to innovation within that locality. This triple helix model has brought these stakeholders together to generate innovative ideas and inspire entrepreneurship within the companies and further community enhancing direct and indirect opportunities within that region. Garcia-Cortijoa et al. (2019) explores this concept further in the study of rural Spain and the drivers of rural innovation in Southern Europe. The study aims at finding the determinants of innovation in agri-food industries in the Spanish region of Castillo-La Mancha. The research investigates internal factors which lead to innovation such as R&D along with technological change which can alter strategic decisions in which industries operate. Internal characteristics and compliance levels of a company set a model for innovation to occur. Additionally, features needed for innovation are training and upskilling opportunities being developed and level of active knowledge transfer within that region.

In an additional study compiled by Hernández-Trasobares & Murillo-Luna (2020), they describe and analyse the synergetic effect of the cooperation of the triple helix model on business innovation in a Spanish context of 11,769 firms. It examined how by firms practicing a degree of cooperation it can lead to innovation in either product, processes, or both. It describes how innovation has been recognised as a key driver of economic development and by combining innovation with science and technology it can be a significant role in achieving Sustainable Development Goals of the 2030 Agenda for Sustainable Development which was adopted by all Union Nations Members states in 2015 (Walsh et al, 2020). The research discusses how essential it is for firms today to innovate through achieving sustainable competitive advantage which can be conducted by collaborative R&D strategies with other agents. Hernández-Trasobares & Murillo-Luna (2020) discusses the triple helix model business innovation and cooperation where the process is defined by, *"cooperation between several elements allows for greater overall effects compared to the sum of the benefits that each of these elements would achieve individually".* (Hernández-Trasobares & Murillo-Luna, 2020, P2) The authors note that good coordination of the different lines of public investment is necessary to achieve the alignment of objectives and knowledge flows between different actors and consequently to increase the adoption of innovation by firms.

This has been done as part of the Spanish Governments Strategy for Science, Technology, and Innovation 2013-2020 which allowed for substantial public financial resources to business innovation through R&D cooperation agreements which has been noted in (Badillo et al, 2017; Alarcón and Arias 2018) (Hernández-Trasobares & Murillo-Luna, 2020). From these three separate variables were identified:

- Product Innovation Variable.
- Process Innovation Variable.
- Product & Process Innovation Variable.

They were examined to explore whether they had been improved or remained the same from coordination between other stakeholders within the triple helix in which a positive association had been noted between the number of firms that cooperate and innovate.

- 73.4% innovated in products.
- 69.5% innovated in processes.
- 54.3% innovate in both products and processes.

This can be shown to be more positive when it reveals the level of innovation by interacting with increased stakeholders within the helix.

- 77.9% of firms that cooperated with *three* helices innovated.
- 75% of the firms that cooperated with *two* helices innovated.
- 67.7% of the firms that cooperated with *one* helix innovated.
- 32.4% of the firms that did not cooperate innovated.

This displays that cooperation of any type presents a positive effect on product and process innovation. There is a positive relationship between export activities, foreign capital, size, R&D investment, and productivity in distinct types of innovation with a negative relationship between innovation and subsidiarity. University-Government-Industry cooperation significantly increases the likelihood of business innovation as the combination of valuable knowledge from these three sources leads to better synergies between them (Badillo and Moreno 2016; Badillo et al, 2017). On investigating it reveals the positive effect on business innovation with University-Industry and Government-Industry cooperation but between University-Government the results are not as clear.

Finally, when cooperation is limited to one Triple Helix agent cooperation with industry yields the best results. It mentions how cooperation with government only through access to public R&D grants has a negative effect following on discussions by Otero et al. (2014) which if public grants are used to cooperate with other agents its positive, while if the grants are the only form of cooperation the level of innovation decreases. In concluding, it notes that these results of cooperation between each of the different helices can be different depending on the institutional framework of the country. Government must encourage cooperation between the different agents that participate in innovation processes not only individually but jointly. A successful way to achieve this innovation is through the creation and support of science and technology parks where the three helices can cooperate (Etzkowitz, 2008).

2.6. General Conclusions & Prospects for Rural Development:

The literature review provides an overview of rural development, innovation centres and the challenges and opportunities which present themselves to these regions. When discussing these topics, it can consist of several themes which relate to enterprises locating in peripheral regions and innovation centres. From the research conducted discussing both the topic of rural development and innovation centres it is almost implicit that society is developing toward a digital information society which has been accelerated due to implications from Covid-19. This is evident in the changes in policy from both a European and National standpoint through the Digital Agenda and National Broadband Plan with the acceleration of these polices following on the National Remote Working Strategy, which is explored in literature by Raisanen et al, (2020). This alteration in societal habits and trends in remote working has opened the opportunities of accessibility for workers to live either rural or urban once the technological capabilities are present. This can include high speed broadband but as the literature notes these capabilities are not always prevalent in peripheral regions as the cost of providing these services peripherally is not always feasible for businesses to install (Bosworth et al, 2016).

The additional issue with both these strategies is the time it may take to reach these rural areas as noted in the literature by Huggins & Izushi (2002); Salemink et al. (2017) there remains a constant issue with the dispersion of these services between urban and rural and the digital penalty is increasing. By implementing this policy effectively, it can lead to the revitalising of rural villages and towns and increase the capabilities of these regions. It is essential that these infrastructural developments are overcome as to develop the ICT capabilities within a region and further close the digital divide which is evident throughout Europe. This type of strategy should provide more than just the internet, but it should create a 'meaningful connectivity' for all users. This is a framework for differentiating levels of internet access so that decision makers are better able to enact policy that helps people to connect to an internet which is useful and empowering. This would involve ensuring speeds, an adequate device, sufficient levels of data and a frequent connection. The concept focuses on the core requirements for a meaningful internet that can deliver substantial benefits. This would include, online learning, conducting business creating and sharing content, managing finance, and accessing information about healthcare. These issues need to be addressed by policymakers with further strategies developed to prevent digital divides occurring while giving regions broadband capabilities and ICT training which can create opportunities and lead to a region becoming more skilled and attracting further investment. Hashe et al. (2020) discusses if peripheral regions got connected it would increase the level of competitiveness they could offer and can further strengthen regional innovation systems through collaborating and networking which would further lead to idea generation and crossovers to create new products and services.

EU strategies shave become leading for peripheral regions which include smart specialisation. These types of strategies need to be educated on more to enhance certain capabilities and create their own rural growth. By regions ensuing these correctly and maximising the output produced it can give ancillary regions opportunities by supporting the activity the region chose to specialise in. Giblin (2008) explores this in the research in where a local business stopped producing metalwork and electronics to focus on producing medical technology products. It was

also seen as evident in Suorsa (2007) in examining the Nordic regions focusing on their highest returning capability to create a sufficient level of regional growth and more recently Biagi et al. (2021) which had examined smart specialisation and how regions which had a strong tourist flow should continue to focus on this as the industry is growing and more resilient to economic shocks.

Open policy for collaboration to occur must also be implemented and is seen as essential by several academics. Ryan & Giblin (2012); Autio & Levie (2015); Garcia-Cortijoa et al. (2020); Bosworth et al. (2016); Suorsa (2007); North & Smallbone (2004); Morrison, (2018) have all noted in their literature that there must be supports in place from state agencies and local authorities to allow for knowledge transfers and open collaboration to occur. This type of crossover where ideas are discussed, and concepts explored is essential to innovation and the creation of products and services. It can allow for all stakeholders to be more involved and can enhance the shared vision for the innovation centre or peripheral area. Social innovation is also an essential feature for rural development to occur as noted through Bosworth et al (2016); Rennie et al. (2016); Steiner (2021); Junsberg et al. (2020); Bellandi et al. (2021). This process of members of the locality of a region working collectively to achieve a systematic change. A lack of services within a region can be the driving force in implementing a social innovation process. From the level of stakeholders within a social innovation it can also lead to an increase in knowledge transfer between different actors which are pursuing to achieve systematic regional change by utilising resources creatively to achieve an enhanced value.

The more growth in a region, further increases the focus which they must have on updating and enhancing the regions infrastructure. This can be seen in Mounce et al, (2020) in examining rural mobility and the direct affect it can have for access of services for an improved quality of life for the locality and in attracting workers to the region. Another enhancement needed is in technology for enterprise advancement. Housing stock should also be monitored and developed upon in correlation with the potential individuals who may prefer to relocate in the region. Gkartzios et al. (2013) has examined the link between housing and rural development which demonstrates a potential issue for Cill Chiaráin as at present adequate housing for potential workers who may wish to relocate there is not available due to restrictive planning by local authorities in constructing new developments. It is essential for policy and local planning to account for the potential of individuals considering relocating as this will further stimulate growth and revitalisation of the regions. These advancements in infrastructure and leisure in urban centres will offer as drivers of growth for the region. These ideals are more achievable presently due to the implicational changes for workers post-Covid. Enterprises are allowing more freedom to their employees in where they choose to work. This proves that if peripheral regions can market themselves as a feasible choice to urban it can create growth and decrease the contrast between urban and rural.

In examination of innovation centres there are various features which must exist for the development to be successful and to create a hub for opportunities, idea generation and growth which may further instil confidence in the locality to pursue their own business interests. The most prominent feature explored from the literature is knowledge transfers must be given the platform to occur. These can take place through collaborations, knowledge clusters and being operational within a triple or quadruple helix. Throughout the literature it becomes apparent that

that the more stakeholders involved of academia, industry, government, and community it leads to enhanced cross collaboration in products and processes. This is evident in Hasche et al. (2020); Morrison, (2018) in examining Robatdalen, Rúta N, Station F and the Barcelona Growth Centre which is all discussed in the literature. By which having the different stakeholders present at cross collaborative workshops, information seminars and using shared areas for interactions it can lead to idea generation and innovation. This can create a reputation for smart business in the centre leading to further enterprise locating here. An example of this from the literature is Giraff Technologies opting for Robotdalen as opposed to Silicon Valley. The digital and transport infrastructure needs to match the business requirements which are essential for delivering tangible and intangible products. By having these infrastructures to a high degree, it can lead to increase of skilled workers working in the region further enhancing the skillset and capabilities the region has. By building on specific capabilities and skillsets, it can lead to a knowledge cluster developing from spin-out enterprises led by entrepreneurs creating businesses from prior knowledge and experience gained in that specific industry. This is examined in the literature in investigating the medical technology cluster which has been established in Galway which began with two multinational firms locating there.

Training and upskilling opportunities should be made available remotely for residents living within these disadvantaged regions. In this post-Covid landscape thought needs to be given to how educational courses and trainings can be conducted for those logistically restricted or cannot commit to completing a course in a set destination. By adapting a hybrid model where content may be received online can further enhance the skillsets of the region and increase the attraction for investment. A commute of two hours to the nearest city to attend college or a workshop may be too time consuming, and with additional transport costs the idea of attending may not be feasible. Additionally, other job-related activities, personal commitments or young children may also impede attending these upskilling opportunities. Therefore, it is integral that broadband capabilities are enhanced to allow for education to be accessed for regions and provide an equal opportunity for individuals in the locality to develop skillsets and compete for prospective job opportunities.

This type of course or workshop could be held within the innovation centre to allow convenience for the locality. This it would allow for a knowledge transfer between community and academia to occur. Rennie et al. (2016) conducted a comparative study in relation to Scotland in exploring innovation centres which could act as a framework to what could be offered in innovation centres to achieve sustainability. These include offering supports, collaborative workshops and training opportunities. A collaborative framework must be established with all agencies working in alignment to assure aims and strategies of the innovation centre are achieved.
From this review of rural literature, it becomes apparent that certain factors are essential for sustainable growth to occur. These include knowledge transfer, open polices and regional capabilities being uncovered and a need from the local community to implement a systematic change to enhance the value of the region. In examination of innovation centres an essential factor is the stakeholders involved in the triple or quadruple helix involved with the centre working collectively to achieve a shared strategic vision of how they wish to see the innovation centre develop. From this it can lead to idea generation with new products and processes being developed and as the innovation centre grows it will increase the level of interest from additional enterprises requesting to relocate there. In the next chapter, it will examine the research which

was conducted through the Delphi method which consisted of a series of surveys with individuals involved in Academia, Industry, Government and Community involved with the marine economy and the Cill Chiaráin where Páirc Na Mara is envisioned to be developed.

Chapter 3: Identifying challenges and opportunities in innovation and business development for the blue economy: A case study for Ireland.

Abstract: When developing innovation strategies and knowledge networks various factors need to be considered in planning for sustainable economic growth. The potential for these initiatives in terms of economic growth and development in regions is well recognised. However, there has been limited attention paid to the specific factors that need to be considered when implementing these strategies in peripheral rural regions. These factors range from skills development and human capital to the level of infrastructure in place within the region, such as broadband networks, transport, and housing. The main objective of this paper is to understand the challenges and opportunities associated with the implementation of innovation and business development strategies in peripheral rural areas. The study focuses on a case study for Páirc na Mara, a state-of-the-art marine innovation centre to be developed in the West of Ireland. Using the qualitative Delphi methodology, a group of experts from academia, industry, government, and the local community, analysed 14 different proposed statements regarding the potential challenges associated with the planned development to succeed. The panel also provided information of the weight and importance of each of the statements considered in relation to the factors required for the success of the proposed innovation centre in the West of Ireland. From these results it became apparent that Government Policies, Irelands Integrated Marine Policy, and the location of the development were the main issues of concern for the participants.

Keywords: peripheral rural areas; innovation centres; Delphi methodology.

The outline of this chapter is as follows:

Section 1: Introduction to the topic.

Section 2: The policy context which is active for Irelands Marine Industry.

Section 3: The methodology, the background of the Delphi Method and its implementation.

Section 4: Analysis of the textual and statistical results from the surveys.

Section 5: A closing discussion and conclusion to the research carried out.

3.1. Introduction:

As society and technology continue to advance the challenges affecting innovation and business development are also developing which can be more pronounced in peripheral areas. Lack of infrastructural developments has existed as an issue for peripheral areas for many years with links to natural resources and a constant migration of its available workforce also included in difficulties experienced. However recent trends in remote working opportunities and digitalisation of industry have led to a renewed interest in individuals and businesses considering locating in rural as opposed to urban settings. These trends indicate a significant research need to understand the various perceptions of businesses and individuals of requirements sought in order to both operate sustainably in a peripheral innovation centre while also creating a guide to implementation needed for efficient remote working through hot desking opportunities. Traditionally, innovation centres are generally located in built-up locations with transport links and an available workforce.

The aim of this study is to identify and understand the obstacles and opportunities for business development and innovation to occur in peripheral regions/economies. The research adopts a case study approach by focusing on a particular development - Páirc na Mara - in the West of Ireland. In 2012, the Irish government set out an Integrated Marine Plan, Harnessing Our Ocean Wealth. The intention of this plan was to achieve growth within the Marine industry while also integrating actions across Policy, Governance, and Business to enable the national marine potential to be fully employed (Government of Ireland, 2012). The strategy allows for improvement to the national GDP while also generating economic growth and employment within the marine industry. Following on these strategy developments in 2017, Údarás na Gaeltachta a regional state agency responsible for the economic, social, and cultural development of Irish-speaking regions of Ireland, announced plans to submit planning to develop an ultramodern marine innovation centre in Cill Chiaráin, a disadvantaged region located in the West of Ireland (Ní Aodha, 2017). The overall aim of this development is to create a hub for marine based activities while also creating job opportunities and growth within the region, considered as a disadvantaged area (Pobal, 2016). The Páirc na Mara development will allow a platform for stakeholders of marine related industries to collaborate, generate ideas and create opportunities this type of development will further enhance the objectives set in the Governments Harnessing Our Ocean Wealth strategy while also accomplishing aims set out in Innovation 2020, Ireland's Research and Innovation Strategy (Government of Ireland,2017) where sustainable development of the marine economy is discussed as an essential national

priority. The rise of digitalisation of industry and advanced technologies will enable smart, flexible, automated, and autonomous production as a basis for reindustrialisation, change value chains and introduce new ways to add value providing opportunities and creating new business models (European Commission, 2019). A considerable number of researchers have explored the adaption of these strategies in creating economic growth.

The Páirc Na Mára innovation centre development supports the strategies described above from a European and National perspective. The policies above have objectives which align with the aims set upon by the development of the facility. The proposed project's location is in the disadvantaged area of Cill Chiaráin which has had significant issues with creating sustainable job opportunities in the region. By following policy, it will enable the aims set out in The Action Plan for Jobs strategy that the rate of unemployment in each region should be no more than 1% higher than the national average (Government of Ireland, 2018).
The nature of this project consisting mainly of marine activities also aligns with the Marine Research Innovation Strategy and Harnessing Our Ocean Wealth. Both these strategies have the aim to enhance the Marine Research Capacity in Ireland by adapting new procedures and technologies to improve efficiency. It also focuses on increasing collaboration which is taking place across the marine sector. Another aim which Páirc Na Mara will have adapted through their proposed Quadruple Helix design involving various stakeholders from Academia, Industry, Government, and the Community. An additional aspect of the project will be the technology which will be deployed following on what marine produce utilises. This advancement in R&D, Science and Technology to adapt the technologies aligns with Innovation 2020 while also completing aims set out in the Research Priority Areas. This will be completed by increasing ICT and increasing global opportunities while also enhancing Irelands reputation as a global leader in STEM (Science, Technology, Engineering, Mathematics). These technologies which will be developed from Páirc Na Mara will be key to the growth of the Bioeconomy with a priority being Marine Renewable Energy including Research, Markets and Technologies with the broader Low Carbon Energy. This initiative will also complete aims set out in the National Mitigation Plan 2017 (Government of Ireland, 2017) and National Adaption Framework 2018 (Government of Ireland, 2018). The enhancement in Digitalisation is also aligning with the aims set out in the European Union's Cohesion Policy (European Union, 2014) which sets out to harmonise the development of all its member states by offering the same technologies as urban regions.

Most studies in the field of innovation and idea generation tend to be completed within an urban context with adequate developments in place with collaborative environments established for knowledge transfers to occur. Although research has been carried out on rural regions opportunities for growth, there is limited evidence of research, to the knowledge to of the researcher, where innovation has been led from the development of an ultramodern marine innovation centre within a disadvantaged region. This research seeks to address the sectoral developments needed while exploring obstacles impacting on the marine industry. The data for this study was collected by administering a qualitative research approach, The Delphi Method. This process allows to gain insights from the stakeholders involved in the marine economy from Academia, Industry, Government and Community. These stakeholders are the groupings which make up the Quadruple Helix from which literature and case study examples has been successfully adapted in different types of innovation centres to enhance collaboration, increasing

knowledge transfers and job opportunities. The process involved in implementing the Delphi method requires interviewing participants on aspects affecting marine development and peripheral areas, which can then be analysed to allow for solutions to be formulated to how the landscape can be enhanced to create economic growth and generate sustainability. A secondary aim of this research project is to demonstrate and promote the Delphi method as a technique for researching within the business environment where consensus is required to understand obstacles and trends currently presenting themselves in the market.

By conducting a Delphi method, the analysis allows for a wider perception of participants' opinions on the industry and what developments need to be implemented to assure long-term sustainability. On the successful implementation of this research method, it may further enhance its adaptability and usage for further research. The research provided an important opportunity to advance the understanding of issues affecting business development and innovation in a post-Covid-19 context. In the last year, there has been a significant shift in the idea of the traditional working life. This includes an increase in remote working in efforts to cooperate with government-imposed restrictions on movement. This has additionally impacted on our standards surrounding urban living with some urban residents increasingly interested in relocating to rural areas, if there is sufficiently developed broadband infrastructure to support their needs. This has also been recently supported by the Irish Government with a new Making Remote Work: National Remote Work Strategy published in January 2021 (Government of Ireland, 2021). This new policy will ensure that remote working is a permanent feature in the Irish workplace in a way that maximises economic, social and environmental benefits.

2.2. Policy Context:

Harnessing Our Ocean Wealth (Government of Ireland, 2012) is Ireland's integrated marine plan framework set out by the Irish Government in July 2012. The strategy allows guidance to which financial investment can have maximum returns creating a first-rate return for the state. The strategy also advocates the future joint funding of projects to generate an impact on Marine Research Capacity to enhance investment. This type of funding and advancement is integral to increasing the reputation of Irelands STEM *(Science, Technology, Engineering and Mathematics)* capacity through the Marine and further Innovation.

The National Marine Research Innovation strategy was compiled by the Marine Institute and was key to the process of creating a detailed review of National and European Policies and Strategies which were enhancing marine related activities. This process identified fifteen major themes which were considered under strategy. This process was undertaken to ensure that strategy is focused on applied and demand led research while distinguishing the importance of a fully functional Marine Research System. In relation to policy there are several interventions that provide support to the Marine Economy in Ireland, these policies include the National Research and Innovation Strategy (Government of Ireland, 2017), Innovation 2020 (Government of Ireland, 2015) Research Priority Areas: 2018-2023 (Government of Ireland, 2012), Action Plan for Jobs (Government of Ireland, 2018) and at the European level, the EU Cohesion Policy 2014-2020 (European Commission, 2014).

The National Research and Innovation Strategy encourages collaboration between organisations involved with Marine Policy. The Marine Economy is involved in a variety of sectors in Ireland. The objective of this strategy is to raise the research capacity across all marine sectors, assure research funding should be allocated with the overall objective to raise research maturity in topics aligned with Government Policies and allow for coherence in the approach to Marine Research by all stakeholders. The strategy also supports the development of Irelands Marine Research Capacity by following on the needs listed in Policies, Plans and Strategies with key areas Economic, Societal and Environmental Sustainability. A key advancement of our Marine Capacity will be dependent on the ability to integrate unrelated sectors. The strategy also aims to enhance a *Thriving Maritime Economy*, increase a *Healthy Marine Ecosystem* and to strengthen our *Engagement with the Sea* (Government of Ireland, 2017).

Innovation 2020 (Government of Ireland, 2015) is Ireland's strategy for R&D, Science and Technology which commits to reviewing priority areas identified to assure they are current and dynamic. By following this review process, it allows for global opportunities, trends and challenges to be identified. It also aims for Ireland to be a global leader while creating a sustainable economy. The future focus of research has also been influenced by the adoption of the *United Nations Sustainable Development Goals in 2015.* This strategy aims to end Poverty, Protect the Planet, and Ensure Prosperity under a new Sustainable Development Agenda. This policy also works along with the 2015 Paris Agreement on Climate Change which aims to reduce Greenhouse Gas Emissions (*GHGs)* while adapting to projected impacts. The *National Mitigation Plan 2017* observes that renewable energy technologies will be pivotal in transitioning Ireland to a Low Carbon Economy by 2050. This will involve moving to products which can be renewed, reused or repaired. Processing in farming systems is increasing due to smart and sustainable food production. This enhances competition among agriculture, food, and the bioeconomy by producing renewable biological resources and their conversion into products and bioenergy enhancing the environment and diversification of the rural economy. This priority also enables marine potential in alignment with HOOW (Harnessing Our Ocean Wealth) and The National Marine Research and Innovation Strategy and Climate Change. Technologies are being developed for traceability, reducing environmental impacts, support efficient resources and water treatment to manage agriculture production and processing sources.

Enterprise 2025 (Government of Ireland, 2018), Innovation 2020 (Government of Ireland, 2015), The National Skills Strategy 2025 (Government of Ireland, 2016), The Eight Regional Action Plans for Jobs (Government of Ireland, 2016), and the Action Plan for Rural Development, (Government of Ireland, 2018) operate alongside the Action Plan for Jobs (Government of Ireland, 2018) strategy in a bid to achieve sustainable economic growth. Ireland's Action Plan for Jobs is the framework set to identify the main future obstacles nationally. It also aims to maximise employment while assuring enterprise remains successful after Brexit and the effects of Covid-19. The strategy potential is reached with job creation, availability of training supports while the enterprise base aims remain to focus on competition, productivity, and innovation. A major objective is to keep unemployment below 1% of the national average with all regions creating growth through specialisation in decreasing regional disparity. Enterprise skills were also key to assure Enhancing Our Competition, Productivity, and Innovation. Developing our infrastructure base is intrinsic when enhancing our competitiveness and eradicating 'bottlenecks'

while progressing peripheral regions offerings (Government of Ireland, 2018). The Regional Action Plans for Jobs have been driving initiatives to build Regional Economic Strengths and eliminate vulnerabilities. *The Action Plan for Rural Development* is inspiring a range of initiatives in a Government approach to enhance the development of Rural Ireland. The 20-year *National Planning Framework* and the aligned 10-year *National Development Plan* will deliver key investments that are necessary to support enterprise growth. *Project Ireland 2040* aligns the overall Vision, Priorities and Exceptions around Development and Growth Nationwide and it is supported by Three Regional Spatial and Economic Strategies that correspond to each of the three regions in Ireland, The Northern and Western, Southern and Eastern and Midland Region (NPF, 2019).

European Union Regional Development Programmes have also been introduced to revitalise rural areas through Smart Specialisation, Digitalising EU Industry, Social Innovation and Enterprise (European Network for Rural Development, 2017). This innovation allows for shifts to development paths for businesses and creates an environment which enables rural enterprises to respond to emerging challenges and opportunities. The EU introduced this initiative in 2016, the aim was to allow for every business in the EU to benefit and promote Digital Innovation. Neda Skakelja, (European Commission) has noted infrastructure needs to be there to make it attractive for businesses with digital skills and applications to operate efficiently. Josefine Loriz-Hoffmann, (European Commission) states rural areas should not be dependent on Agriculture and other primary activities. To combat this the Cork Declaration was established which allows for policies to be analysed through a 'rural lens' which assures policies are utilised as beneficial as possible for the rural environment. (European Network for Rural Development, 2017). In the EU Cohesion Policy, it promotes the use of the Smart Specialisation Innovation Strategy to help regions build on their strengths and achieve competitive advantage by developing and optimising production which they are most efficient in while meeting the demand of the market. This can also allow for enterprise to identify further opportunities and market developments in a coherent manner while avoiding duplication and fragmentation of efforts. (European Commission, 2014).

2.3. Research Methodology:

This paper uses the Delphi Method to study what sectoral developments are currently needed for rural innovation to occur with the results then applied to the context of Cill Chiaráin. The Delphi method has been widely used in similar studies where there is a need for initial exploratory research. This has been noted in International Business (Griffith et al, 2008), Omni-Channel Retail (Von Briel, 2018) and Manufacturing (Culot, et al, 2020). This method is often applied in research to obtain insights into trends and developments within an industry. Therefore, it allows for the identification of a structured account of obstacles and market trends which may present in the future.

In deciding on which research method to use in conducting this research project. There were other types of methodology explored, this included content analysis which can be defined as, "Any technique for making inferences by systematically and objectively identifying special characteristics of messages." (Holsti, 1968). Although this method had many advantages such as being able to directly examine communication using text and inexpensive in its process it was decided that due to time consumption which is associated with the method in the form of interviews. Another method suggested had been a focus group with the participants selected for

the research study. This was dismissed as an appropriate method as due to the difficulty which would come from trying to organise a suitable time and venue to bring all the participants together and the difficulties which may occur in conducting group interviews with possible issues being the most outspoken participants dominating the interview with some opinions and ideas never being heard or explored.

The Delphi Method is a type of inclusive methodology which allows for expansive opinions on different topics and statements through a collaborative basis. The method has been altered and adapted to be applied in various sectors which allows for expert opinions required to make predictions and forecasts for the future. (Gupta et al, 1996). The Delphi Method has been defined as, 'a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.' (Linsetone & Turoff, 1975, P3). Based off the initial research and level of uniqueness of the project a Classic Delphi approach was chosen. This approach allowed for Anonymity, Statistical Group Response and Stability in responses for a facilitated, iterative group communication process to solicit feedback from participants on a particular subject. (Linsetone & Turoff, 1975). Following this approach, the facilitator collected the feedback via online surveys which Microsoft Forms was selected as a medium which allowed for Anonymity. The information was analysed and relayed back to our participants which allowed for reflection before answering the next round. This iterative process is repeated until a consensus is obtained from the participants. This process allows for all participant's opinions and ideas to be credited and eliminates issues which can occur in groups discussions. These issues can be where the most opinionated and outspoken dominate the discussion (Dalkey, 1969).

The experts involved in this project came from Academia, Industry, Government and Community. Throughout the research the experts chosen are not in direct communication. As an effect implemented from Covid-19 restrictions on travel and direct meetings our sample size was too large and dispersed. By implementing a more formal direct alternative method it may have been too difficult and costly to gather the responses. In the following section an insight is completed of the history of The Delphi Method and its effectiveness in forecasting in International Business (Griffith et al, 2008), Omni-Channel Retail (Von Briel, 2018) and Manufacturing (Culot, et al, 2020).

In implementing any type of methodology there can always be constraints and issues which can occur and enhance the difficulty of completing research. In terms of implementation of The Delphi Method it still presented its own obstacles and challenges. These obstacles were based on the timelines of the research taking place which were brought upon by implications imposed from Covid-19. In complying with travel restrictions imposed distributing the surveys through Microsoft Forms was the most efficient procedure. Advantages of The Delphi Method were that it could be taken by as many agreed to participate with an additional advantage from employing the survey through Microsoft Forms was that it could be completed when most suited the participants schedule (Linestone & Turroff, 1975). By implementing email as a communication eliminated issues concerning disparity of our participants which was additionally cost efficient. These elements of The Delphi Method were essential due to the limitations brought from Covid-19. If an alternative method had been chosen which required group meeting for example obstacles would have been constant. It also allowed for most opinionated participants leading

discussions to be avoided. The iterative process was also advantageous as it allowed participants to review their answers and gave them opportunity to conduct an alternative viewpoint.

When conducting the Delphi method, there were few disadvantages in comparison to advantages. This was that it can be difficult to retain participant's engagement in the iterative process of several round of surveys. This was apparent as the rounds contained the same questions with the objective a consensus would be reached. The nature of experts as participants is that they hold viewpoints and ideals which can be difficult to alter as they are based on their own experiences. Additionally, an obstacle from the iterative process due to Covid-19 was a formal meeting never took place with researcher and participant from restrictions imposed. This made it more difficult to get participants to engage with the research so in some cases it took several follow up emails and calls to assure the completion and return of the surveys as by allowing for a decrease in respondent returns can weaken the credibility of the study. On reflection, *The Delphi Method* was the most reliable method as it was easily overseen remotely and allowed experts to participate from home.

2.4. Implementation of the Study:

In the planning stage designing a suitable questionnaire which would appeal to all participants was essential. The more concisely structured the questionnaire, the more positive response rate would be expected. The preliminary survey design involved examining different themes that were influencing factors in the efficiency of marine enterprises while also exploring issues facing peripheral regions. This exploration was conducted through a review of research studies on the marine economy, rural innovation, policy, digitalisation, knowledge transfer, capabilities, and sustainability. These were all features which could assure regional development and provide a background to infrastructure led economic growth.

Following the initial literature review, a brainstorm activity was conducted of possible statements on different topics and discussed with an industry expert. On conclusion it was decided that 16 statements would be issued, and each participant would be requested to rank their agreement on the statement from strongly disagree to strongly agree. For each statement,

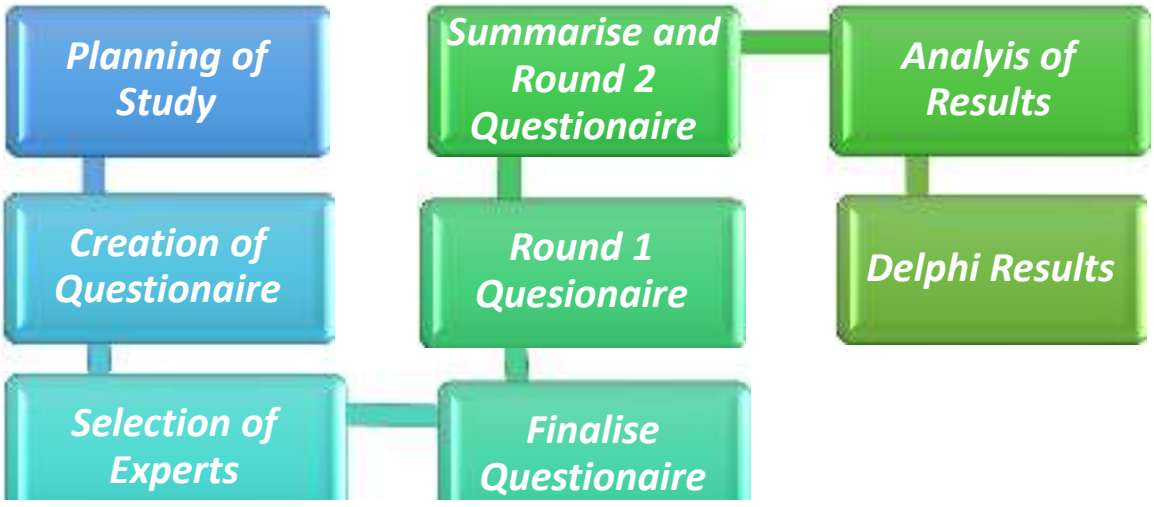

Figure 3: The methodological framework for data collection.

participants were requested to give a reason for their statements ranking decision. The survey design was done to avoid repetition and overlapping themes.

The pilot phase of the study was conducted with individuals from Udáras Na Gaeltachta, Galway-Mayo Institute of Technology and the Marine Institute. This process of Delphi Method pilot tests was an important step in the research as it allowed an opportunity to refine the research instrument. to test the data analysis techniques and to make the relevant adjustments needed to questions which had been composed for the survey. This was conducted in line with the literature on Delphi studies such as Hallowell & Gambatese (2010) that note that pilot tests of the surveys are suggested to ensure that the level of detail is appropriate for the study. Jairath & Weinstein (1994) also discuss the importance of pilot testing in not only identifying wording difficulties but also in improving the feasibility of the administration. Pilot studies have been noted in literature to be likely "underdiscussed, underused and underreported" (Prescott and Soeken, 1989, P60). This pilot Delphi process also allowed the research to discover any ambiguities which may be evident in the survey (Gordan, 1994).

A key step in implementing *The Delphi Method* is to design the criteria for participant selection. The criteria were distinct to each stakeholder group which the participant would have to possess four from the possible five to be deemed an expert. These types of criteria were generally only achievable by the participant having a significant amount of experience acting within that stakeholder group. From this experience gained by participants in their field it typically followed that these participants would contribute to initiatives, committees, projects networking events and advisory groups further strengthening their potential expert status. By implementing this type of individual criteria requirements, it allowed for the participant to have a mixed knowledge of the themes and topics which would allow for no participant to be fully knowledgeable in every survey aspect. As selecting knowledgeable experts is an important feature of The Delphi Method. (Rowe et al, 1999) By applying criteria to be met it further enhance the quality of the research, the key issues given for declining to participate was due to prior work commitments which would not allow them to give the commitment the iterative process requires.

Although the quantity of accepting contributors to the survey was mainly positive, a contributing factor which may have led to participants opting out of the survey may have been due to the unprecedented effects of Covid-19. This societal alteration instigated an array of closures of businesses and schools which with added stresses and responsibilities led to participants unable to fulfil the iterative process the survey requires. The mediums acquired to communicate with participants was email and through LinkedIn. On first interaction if the participant agreed to partake, a more detailed email was sent which gave an extensive background to the project and the commitment required from participants. In aligning our criteria to participants, it amounted to 26 potential experts from all stakeholder groups from this 17 agreed to contribute to the project. This corresponded with a rate of response of 62.96% which is significantly higher than other studies carried out with 17% (Von Briel, 2018), 23% (Dinwoodie, 2013). This figure being much closer to the average rate of response when conducting The Delphi Method (Nowack et al, 2011). These rates can be accredited to two factors, firstly the potential sample identified was lower than in the research compiled by both Von Briel & Dinwoodie. In both these studies a vast number of participants were stated to hold expert status. Additionally, in relation to this study, participants were selected in a method that would allow for roughly equal number from each

stakeholder group. Another factor was that it was easier to communicate with this type of sample size as there is an iterative process involved which is typically repeated until stability and consensus is gained amongst the participants. (Von der Gacht, 2012).

Table 1: Participant Criteria Required.

Industry
• *Involved in marine-related business with a range of products sold nationally and/or internationally.*
• *Involved in business with product(s) certified with a Quality award.*
• *Have five or more than five members of full-time staff.*
• *Member of a marine-related advisory group, industry network, taskforce, or foresight committee.*
• *Has operated within an innovation centre for over two years.*
Academia/Media:
• *Possess at least 5 years' experience in a marine–related area or working with successful innovation hubs.*
• *Member of an advisory group/committee to enhance entrepreneurship within a region.*
• *Contributor to a marine-related strategy document.*
• *Published in a marine research area or invited to speak at a relevant national event in the last 3 years.*
• *Represent a media contact point on marine-related issues.*
Government:
• *Has been involved with strategy involving the marine or innovation industry.*
• *Has been involved with helping to support projects in the marine industry.*
• *Worked at least two years with a committee such as LEADER, Teagasc, Enterprise Ireland or Local Enterprise Office.*
• *Has been involved with an innovation related strategy document within the last ten years.*
• *Has spoken at national, European, or international events regarding the future of either marine or rural innovation.*
Community:
• *Has been a member of local initiatives that aim to create growth within an area and/or has a supervisory role under RSS/CEP.*
• *Has been living in the area for over 15 years in a certain trade.*
• *Has been a member of local government for at least two terms. i.e., councillor, TD or other.*
• *Has been working in the area for over 10 years in a respected role in which community engagement is essential i.e., Principal, GM of a hotel or Publican.*
• *Recent graduate from a third level institution and from the area.*

A personalised email was sent out to all participants acknowledging them for agreeing to contribute. In this email was additional information regarding the process of The Delphi Method and the requirements from the iterative process. The experts were then sent a URL link to a Microsoft Forms Survey entitled, 'Marine Economy Development: Part 1'. The process of administering the survey online had several advantages which included High-Quality Data Collection, Ease and Speed of Survey Administration, Direct Communication and Rapid Feedback (Gill et al, 2013). The layout of the survey began with a brief introduction and background of the Páirc na Mara development. The sequence of questions began with experts

being asked what type of marine activities they would consider themselves knowledgeable in and what organisation they are involved with. By employing these questions, it allowed for identification of which participant had completed the study as only one person from each respected organisation could take part as to keep biased viewpoints to a minimal. The experts were than required to give their stance on a topic related statement which the ranking was from strongly disagree to strongly agree. The experts were then asked their reasoning for that stance. For analysing the information obtained and to illustrate it using statistical data the ranking indicators were strongly disagree given the numerical value of one while strongly agree was given the value of five. When analysing the information obtained, all identifiable information was excluded as this assured *anonymity* for all our participants which is a prominent theme in conducting *The Delphi Method* (Hasson et al, 2000). The administration of the surveys for each group was focused on separately. The order which they were given were Government, Industry, Academia and Community. The community group was the most difficult to obtain participants as with travel restrictions imposed with the participants being ultimately obtained through phoning people who may have known someone fitting the requirements from the Connemara Region. The participants were all allocated a week to complete the first-round survey, if this were incomplete on day 4-5 a follow up email would be sent to remind them of the importance of the survey and if they had any questions regarding it. On completion, all surveys were analysed to identify patterns and developing trends, as part of the iterative process participants received a summary of the answers given in the first round which is an intrinsic element of administering The Delphi Method (Nowack et al, 2011). An additional PDF was sent with the second round of the survey containing a detailed summary of answers which had been given in the first round all while having anonymity assured for our participants. In literature concerning The Delphi Method there is no preferred process in communicating the results obtained from the preceding rounds. In readings it is apparent that several techniques are used which include graphic projections of results along with literal explanations of results and topics which were raised (Schmidt, 1997). These can include graphical representation (Malhotra et al. 1994), along with statistical outlining of central tendencies, variances and ranking of the statements (Woff et al. 1996, Chocholik et al. 1999). Both types of methods were used in our report findings which were given to the experts as part of the feedback element of the completed rounds (Hasson et al, 2000). In the reports compiled of the results experts were provided with an illustrative colour coded pie chart with percentage results for each statement of (Strongly Disagree-Strongly Agree). Along with this report there was a textual summarisation of additional comments which were made in each of the topics. Participants were also given the statistical data of Median, Interquartile Range and the Standard Deviation for each topic. This statistical feedback gave our participants an opportunity to observe the spread of the data by reflecting the standard deviation in comparison to the mean. Therefore, it allowed examination of what topics they were most in common with while also identifying topics they were in discordance with.

Feedback was issued to the participants two months after the initial first round had been conducted. An issue which can arise from administering The Delphi Method is information can be dependent on the numerical information collected with minimum reasoning to why the data would be spread in such a specific direction. As a method to combat this, a qualitative feature was incorporated to each question which allowed the participant an opportunity to explain why they would be of the opinion they selected (Dubios et al, 2019). This allowed for a type of

minimal dialogue to occur between the participants as they could examine the alternative answers given while being given an opportunity to understand the reasoning for those participants holding a certain viewpoint of a topic or statement. This was evident in several statements posed to our participants e.g., when discussing a topic related to policy, a participant who has benefited from alterations and adjustments will be more confident of their efficiency than someone who feels as though their region has been overlooked and has not seen the advancements. Timing is another vital component when conducting The Delphi Method as it needs to be done with precision, a length of time must be chosen that will allow for participants to not feel as though they are being besieged with surveys as they may be extremely busy with their own work life and commitments. This issue was something which the research was mindful of due to the shift in societal routine and work environment as some participants may also be trying to supervise children with schools closed nationwide in response to Covid-19. Another timing element was to assure the window for participants was brief enough to re-establish the purpose and answers given in the previous round. Two months was chosen as adequate time to begin distributing the subsequent round of the survey. Overall the survey ran for 4 months from distributing the first round to receiving the second round.

Following on the success of the first round, an identical procedure was followed for the second round. This email consisted of thanking the participant once more for agreeing to contribute to the research project and allocating time from their schedule. The first-round results were attached with the URL link to the second round. Nowack et al. (2011) discusses this type of iteration process as essential when conducting The Delphi Method as it allows the chance to understand their fellow participants thought process. This research was completed with two rounds of surveys, there are no set number of rounds which must be conducted when using The Delphi Method but to keep in line with the timing of the project and the level of consensus reached by the surveys administered, two rounds was most acceptable.

As of the nature of this type of research project there was no need for ethics approval. This was due to no type of experimentation being completed as part of the research. There was also no harmful or sensitive information required from the participants who took part in the survey rounds. The information acquired was stored online securely at GMIT servers, and at no point was there any physical copy of answers obtained as distribution of the answers obtained for consensus to be reached was created online and redistributed by e-mail ensuring that anonymity was held at all times, in line with the Delphi study methodology. There was also a Participant Information Sheet attached to our initial e-mail to participants which noted that by taking part in the survey it meant they understood what was being acquired of them. Following on this, the research was conducted in line with the GMIT Academic Code of Practice.

Table 2: Description of Participants selected.

Grouping	Detail of Participant
Industry	Chief Executive Officer of company specialising in the commercialisation of renewable energy, with significant experience in renewable energy spanning over 15 years.
Industry	Managing Director of a leading multinational, which is the largest producer of Irish farmed Atlantic salmon.
Industry	Executive Chairman of Marine Renewable Industry representing emerging technologies in wave and tidal energy.
Industry	Managing Director with Irish Seafood Company located in Cill Chiárain.
Government	Senior Technologist with enterprise related association in Ireland with a focus on water/wastewater sector and promotion of these enterprises.
Government	General Manager in marine and ocean energy related enterprise. Participant has over 20 years' experience in marine survey, vessel operations & commercial management.
Government	Director and with the Irish Marine Institute.
Government	Senior technologist, Irish Sea Fisheries board, with strong interest in R&D technologies for Irish seafood.
Academia	Vice-president for Research and Innovation in Irish third level institution. Participant has also vast experience with marine related organisations globally.
Academia	Lecturer in Economics and Director of marine-related research unit at Irish third level institution. .
Academia	Senior Research Fellow in SFI Research Centre for Energy, Climate and Marine at Irish third level institution.
Academia	Head of Department and active researcher in marine-related discipline with experience in Ocean Science Services in the Marine Institute.
Community	Development officer with a company located in the Cill Chiárain region.
Community	Regional Coordinator at Fisheries Local Action Group and Development Officer with fisheries organisation for the support an development of the seafood industry.
Community	Údarás na Gaeltachta staff member from the Cill Chiárain region.
Community	Business owner located in the Cill Chiárain region with strong involvement in the local community.
Community	Participant who was both from the Cill Chiárain region and was a teacher within the region.

2.5. Results:

This section provides details of the findings from the study. Results are structured by main theme as presented in Table 2. The table below presents the survey statistics of Median, Inter-Quartile Range (IQR) and Standard Deviation. The median allows for an insight to the middle set of the answers given in the survey, the IQR gives an indication to the spread of the data received while the Standard Deviation displays an advanced insight to how different the answers were within the overall survey. From the information given if the data were closely grouped the difference will be small while if the distribution is widely spread the difference will be greater.

Table 3: Statistical data of survey results.

Summary of Results from Round 1 & Round 2.	***Round 1***			***Round 2***		
1 = Strongly Disagree, 2 = Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.	***Median***	***IQR***	***Standard Deviation***	***Median***	***IQR***	***Standard Deviation***
Government Policies: *Reductions in certain taxes such as the Corporation Tax should be given to businesses looking to start up in disadvantaged areas like Cill Chiaráin.*	*2*	*3*	*1.778378*	*4*	*2*	*1.5622426*
Gaeltacht Area: *The Páirc Na Mara innovation centre being in a Gaeltacht area may act as a deterrent for businesses to relocate within the area.*	*2*	*1*	*1.239489*	*2*	*1*	*1.277636*
Harnessing Our Ocean Wealth: *Ireland's integrated marine plan 'Harnessing Our Ocean Wealth' and associated activities such as the National Planning Framework are doing all they can to achieve sustainable development for the ocean economy.*	*3*	*2*	*1.231085*	*3*	*2*	*1.111438*
Financial Aid: *Financial aid for emerging businesses in the marine sector is obtained with ease.*	*3*	*1*	*1.214104*	*2*	*1*	*1.064121*
Graduate Relocation: *There is appetite among newly qualified graduates to move to rural areas such as Cill Chiaráin.*	*2*	*1*	*1.185261*	*2*	*1*	*0.970143*
Marine Produce: *There can be accessibility, regulation and legal issues associated with products that originate in the ocean e.g., Seaweed/Seafood.*	*4*	*0*	*1.058824*	*4*	*1*	*0.606339*
Stakeholder Collaboration: *More involvement is needed from Academia, Industry and Government for Páirc Na Mara to reach its full potential.*	*4*	*2*	*1.028992*	*5*	*1*	*1.186629*
School Education: *Education given to students in primary and secondary schools about marine related courses and job possibilities is sufficient at present.*	*2*	*1*	*1.022244*	*2*	*1*	*1.169464*
Potential Industries: *There are other types of industries outside of the marine which I could foresee setting up in Páirc na Mara.*	*4*	*1*	*0.97725*	*4*	*2*	*1.114741*
Housing Infrastructure: *For the long-term sustainable development of the area, additional housing should be provided.*	*3*	*1*	*0.973703*	*3*	*1*	*1.00367*
Upskill Requirement: *Relevant training should be put in place to upskill the local workforce to meet the new job requirements.*	*3*	*2*	*0.970143*	*5*	*1*	*0.795206*
Industry Developments: *Smart Specialisation* and Digitisation of industry is promoted currently for businesses in rural areas.*	*4*	*1*	*0.91129*	*4*	*1*	*1.007326*
Infrastructure Requirements*: For sustainability to be achieved increased infrastructural requirements are needed, such as increased frequency of bus routes to neighbouring towns and villages.*	*4*	*1*	*0.872494*	*4*	*1*	*1.178858*
Graduate Expertise: *Graduates lack certain skill sets required to start their own business in marine-related industries.*	*4*	*1*	*0.729981*	*4*	*1*	*1.346974*
Local Workshops: *There is a need for Entrepreneurial Workshops in the area, to increase confidence for social innovation and social enterprise.*	*4*	*1*	*0.757888*	*4*	*1*	*0.857493*
EU Policy Incentives: *EU policy incentives are equally distributed in both urban and rural areas.*	*3*	*1*	*0.757888*	*3*	*1*	*0.903425*
Export Capabilities: *There are adequate training supports for indigenous companies to adapt to exporting their products into a global market.*	*4*	*1*	*0.775936*	*3*	*2*	*1.046704*

2.5.1. Government Policies:

This topic had the most dispersed responses with tax incentives being allocated to businesses relocating in Cill Chiaráin to counteract the lack of amenities in the region. Altering incentives should not be a USP for businesses as this will lead to relocation once they have been removed which limits the regions sustainability. Businesses should be able to compete in international markets without favourable subsidies. This idea was seen as vital to both entice people from urban areas and to counter the low standard of infrastructure regionally present. It would also be needed to stimulate I.T (Information Technology) and Entrepreneurial investment with an index format developed for all start-ups. Arguments on the subject stated that there was taxpayer funded mechanisms available which they could benefit from and to obtain further incentive may be difficult under the EU State Aids Regime.

2.5.2. Gaeltacht Area:

There was significant support for the innovation centre being located within a Gaeltacht area if infrastructure, services, and marketing are adequately supporting the project. *"I hope culture is not diluted but also the place should not be sterile either, we need to open our gates and attract business and services to the area."* An additional aspect which was evident in the survey was the concern of the site's geographical location in relation to an urban centre as the estimate commute is 66 Kilometres which was noted as difficult to attract talent. Regional adaptions and infrastructure need to be implemented to advance socially and economically, *"its proposed location is too far from a critical mass of allied supports, expertise, infrastructure, pipeline of potential companies or start-ups."* Ideals of opting for rural as opposed urban due to Covid-19 and increase in remote working was supported, there was also note of housing challenges the Gaeltacht faced.

2.5.3. Harnessing Our Ocean Wealth:

This policy had a significant dispersion of opinions, it needs to be supported by agency action which supports industry but is lacking in practicality, outdated and revisions are needed. Issues which were experienced involving the policy were licensing, lack of departmental coordination, Planning framework is deficient in managing maritime development. Centralisation with the marine coordination group is needed to convert the vision into tangible products through diversification and further opportunities. Arguments made included, "The Aquaculture Regulatory Authority is within Department of Agriculture, Food and the Marine (DAFM) which has exempted itself from Marine Spatial Planning which has not adapted or implemented the independent Aquaculture License Review Report published in May 2017". The disconnect between land and marine planning will be more pronounced when marine planning is implemented. Arguments supporting the strategy felt it was doing its most to enhance marine industry.

2.5.4. Financial Aid:

The idea of financial aid being obtained with ease was mostly disagreed amongst participants. Points made were that it was largely dependent on the project which funding is needed for but by allowing for more funding it will incentivise indigenous start-ups. The process was also noted as being difficult to avail of finance with regulatory framework not fit for purpose. A private equity blue fund was noted to prime marine enterprise as due to the long development and high-risk

factor timeline for marine enterprises it can be a disincentive for obtaining finance. There needs to be a degree of 'rigor' for companies which fall outside Enterprise Ireland and LEO (Local Enterprise Office) which can be difficult to avail of. There are accelerators and programs available from Enterprise Ireland to encourage and Fisheries Local Action Groups (FLAGS) programs to develop viable businesses and jobs in coastal areas. Additional aid needs to be allocated for offshore renewables, fisheries and aquaculture with information not correctly given about aids and funding. One Entrepreneur noted, "The Government has done nothing for us even though we employ 35 people in South Connemara".

2.5.5. Graduate Relocation:

Majority were opposed to the idea of graduates relocating to Peripheral Regions. An idea was to create a package which would include infrastructure, housing, services, and a method to integrate into the community as to avoid isolation. It may be difficult to allure them to rural as opposed to urban and if they have no connection to the area they may leave after a few years. It may be more suited to people who have left the area looking to return. It was also noted that the idea to be a part of the project may be an attractive concept. The implications brought by COVID-19 were also a reason for relocation with the rise of remote working.

2.5.6. Marine Produce:

There is accessibility, regulation and legal issues related to products originating from the ocean. Issues which were mentioned included licences being difficult to obtain, quality issues which must be overcome, fish farm lobbyists and regulation needs to be dynamic. There is also an over reliance on maritime resources, foreshore access and leases. Seaweed is surrounded by local and historical collection rights while fisheries stock quotas are regulated under the CFP (Common Fisheries Policy) while aquaculture production requires a foreshore and aquaculture licence. Brexit was also linked to future transport issues from exporting a perishable product to European markets. Regulation was noted as important with the IFSA (Irish Food Safety Authority) maintaining a high standard. There can be harvesting issues with any product originating from the ocean to avoid exploitation. The issue of too many departments and agencies were addressed with the idea to resolve to create '*a one stop shop'* for businesses.

2.5.7. Stakeholder Collaboration:

This was noted as an essential feature for the development's success. This would involve all stakeholders of academia, government, industry, and community working together for decision making. This would also be key when developing and organising training, workshops, supports, programs, and strategies. By adapting this it should overcome policy issues being experienced. In literature this concept has been explored to create a sustainable and attractive hub for idea generation to occur and businesses to operate. The project will potentially serve as a landmark project for all marine to strive to achieve. "A coordinated approach should have been implemented from the beginning if so, its location would have been different as it is a concern. A central location with critical mass of expertise to support pipeline start-ups willing to engage." – *Academic participant.*

2.5.8. School Education:

This had a high consensus with marine opportunities not being publicised in schools. This has led to a small number enthused to pursue a career in the sector. “There seems to be an opinion that the industry is for those academically inclined" – *Industry participant.* This lack of education of jobs is projected in offshore energy and new technologies which are not fully operational. The marine needs to be taught intrinsically incorporated within the syllabus similar to science, business, and geography. Education needs to be enhanced for adults as education may be undone by parents’ perceptions of the industry. One participant recalls living 20 minutes from the Atlantic and never hearing the ocean mentioned in school.

2.5.9. Potential Industries:

From results obtained it was in a favourable view of additional ancillary industries locating and developing within the Cill Chiaráin region. The industries which were deemed as suitable were in Tourism, Survey, O&M, Consultancy, Cluster Opportunities and Renewable Energy. By forming a collaborative platform was noted as key in aligning with the Harnessing Our Ocean Wealth policy to *‘marinise’* non marine activities. This would also allow for industrial crossover in high-tech, Information Communications Technology (ICT), Internet of Things (IOT) and Comms. Within the results there was opposing arguments that it should be strictly marine but be inclusive of sectors like Biopharma. Hot-desking activities were promoted following an increase in remote working which also amplified the societal trend of opting for rural as opposed to urban. Overall, it was highly proposed that the centre should hold a variation of uses with one participant adding, “it is important for Páirc Na Mara to make maximum use of all resources no matter what sector, it will be vital to have other industries in the area.”

2.5.10. Housing Infrastructure:

This topic brought a neutral response, this may have been due to a lack of knowledge of housing stock in the region. Suggestions to resolve this involved conducting an environmental scan to identify housing availability and align services for demand. This could help address infrastructure difficulties involving transport. Planning for affordable housing should be part of the agenda for the development as housing is vital to sustainability. Schemes were explored to encourage restoration of vacant houses. It was noted that although housing may be developed workers may still choose to commute and housing should be addressed in the future. Additional barriers include lack of sewerage treatment facilities, language conditions and Galway County Council.

2.5.11. Upskill Requirement:

A firm consensus was reached about upskilling needed in the region. The success of this should be implemented by designing courses in a coordinated approach while assuring they are accessible, inclusive and provide business requirements. Innovative technologies may require advanced technology skills which will be attractive to employers. This type of accessibility will only benefit the community, if specialised upskilling was needed it should be provided by the businesses. Courses should be completed in conjunction with the National Maritime College located in Ringaskiddy, Cork.

2.5.12. Industry Developments:

These activities are now an integral part of Peripheral Regions which are growing in popularity in recent years. Comments were that it was vital going forward for companies to identify their USP through Smart Specialisation. These are currently promoted through Regional Assembly Operational Programs and County Management Plans. It was noted how this could be difficult to complete with the low levels of high-speed broadband at an EU Level. Companies must not become too specialised as they must create opportunities for growth while attracting investment. Solutions to this could be a replication of Arranmore in which they partnered with Three Ireland to implement more efficient broadband infrastructure to revitalise and encourage relocating to the village.

2.5.13. Infrastructure Requirements:

Advancements in infrastructure was believed to be essential. Primary issues were to increase the frequency of buses and improving access roads while adhering to climate change efforts to decrease the carbon footprint. By improving on these issues, it would decrease the obstacles surrounding the housing situations. Projects by IMERC (Irish Maritime and Energy Resource Cluster) and MaREI (Energy, Climate & Marine) have adapted these types of infrastructure and been effective. Sewerage systems were also infrastructural issues which need to be addressed to attain success while also an overhaul in the current procedures to obtain housing. The sector of renewable energy was also referenced with specific mentions towards kinetic energy with advancements achieved through additional meters of quay side and water depth. Killybegs was given as a prime model of a location which had been enhanced through marine activities. Opposing comments were surrounding the practicality with shift work which can occur in innovation centre. It can also be difficult to encourage workers to forfeit the flexibility which driving can provide to them.

2.5.14. Graduate Expertise:

Graduates may lack the skillset necessary to start their own business, they may lack educational experience but could still possess the drive needed to start their own business. Solid business capabilities and mentoring or a selective module for marine graduates to gain business experience and learn about Global Market Opportunities and Raw Material Constraints will be needed. One participant mentioned that, “from working with Sustainable Energy Authority Ireland (SEAI) we have been pushing for commercial skills we have been advocating for an accelerator program should be given to meet the skills.” It was noted people may also be less inclined to pursue a career in the marine due to the industries poor image. There are incubators and accelerators that could be used to help graduates e.g., Ignite in University College Cork while Postgraduate opportunities are needed to gear up Engineers.

2.5.15. Local Workshops:

Encouragement was given to training, research, networking, and knowledge exchanges arranged. The workshops' objective would be to enhance the social innovation within the marine industry which would generate local support and idea generation for the project while affirming future clients are available. The key to assuring their successful implementation is by making them inclusive while located in accessible venues, this will extend opportunities locally with a long-term positive impact. Coordination between agencies is essential for the further future success.

Participants further noted that in demanding specialised industries training may need to be assigned within the organisation. Additional, training supports should also be offered in areas like entrepreneurship, technology, and human resources.

2.5.16. EU Policy Incentives:

Consensus was obtained in relation to incentives distribution being focused on coastal and urban as opposed to rural. One participant mentioned, "that the new biodiversity plan being discussed at EU level was concerning for rural Ireland." National authorities which have different interests in each country distribute these incentives which can benefit a range of agencies and departments. Alternative arguments felt rural businesses receive more incentives as it is more difficult to develop peripheral business as they lack amenities and opportunities. Complications in applying for EU funding was also noted, "businesses should be able to establish without grants but accelerate further with them."

2.5.17. Export Capabilities:

In terms of adequate training supports being made available, the issues noted were to allow for supports to be more accessible with an emphasis on training for smaller firms to export. An accelerator program may resolve this. Enterprise Ireland, Bord Bia and BIM were noted by several participants as having excellent supports in place but the uptake from Marine related enterprises may be the issue, and that information needs to communicate more with clients including Training, Mentorship and Coaching. A more coordinated approach was suggested as to be put in place offering training, and systems implemented for the logistical constraints allocated by *Brexit* and *Covid-19*.

2.6. Discussion:

From the beginning of the undertaking of this research project in analysing obstacles and challenges for an innovation centre being developed in a peripheral region there has been significant alterations to the typical work life influenced by the events of Covid-19. As mentioned in the introductory paragraph remote working has now become prominent in every industry with societal habits, ideals and career aspirations shifting also. This lifestyle transformation has directed people to locate to more regional areas outside of the major urban centres. This shift may be potentially beneficial to Údarás Na Gaeltachta completing the aims set from the development with potential growth taking place from a rural directed migration.

It is apparent from the data compiled and changes nationwide, the issue with infrastructural requirements is currently a factor more than before. To brand the region attractive for remote working a vast improvement in broadband capabilities is needed in the region. This is something which multinationals are factoring more into their development plans with enterprises regarded as 'tech-giants' such as Twitter and Slack withdrawing from their headquarters with employees informed, they may never need to return to their work offices once more. The shift may also allow for industries which do not supply tangible products consider relocating as the capital which may be saved from operating from a smaller premise with rotating staff may be a key feature for a new enterprise seeking a cost saving.

Another trend which is currently taking place is individuals taking advantage of the opportunities brought from online courses which can allow them to participate in courses in any location worldwide. This is an essential time for individuals to utilise this time to upskill and gain a new qualification which can be brought to the newly adapted workforce. There was considerable discussion when implementing these courses and workshops for coordination to occur between both departments and agencies which would allow for the most optimal training to occur that can be adapted across a range of disciplines. These workshops could provide entrepreneurial guidance to the community with accelerator programs introduced to increase market potential and exporting opportunities.

Harnessing Our Ocean Wealth came under severe scrutiny throughout the survey with a more centralised plan required from Government as lack of coordination between departments a present obstacle. The policy has been reviewed as both outdated and not serving to create a sustainable marine environment. This is evident when discussing licensing where it is still viewed as an immense challenge although it has been noted as essential for development. Financial aid is also mentioned as being difficult to obtain from departments and agencies accredit to the long term and high-risk factors which marine products typically tend to be due to access, licensing and regulations acting as obstacles to fully utilise resources available. Industry Developments of Smart Specialisation and Digitalisation are becoming common for regions with individuals identifying their most efficient product and focusing on optimising its production for the most resourceful output. Digitalisation is also developing rapidly in response to the rise in remote working and creating intangible products which do not require added costs i.e., packaging. All efforts are completed electronically keeping expenditure to a minimum.

Education of the marine within schools if progressed efficiently should create a more positively advanced and efficient image amongst society. This had been noted by several participants who recalled no mention of marine careers from school although located near the ocean. Insights were explored into enhancing marine education and allowing it to be more intrinsic and equal to Geography, History and Science with a new type of research being allocated funding to identify how this can be achieved. Collaborative stakeholder environments were also highly promoted by strategic polices implemented by the European Union. The helix effects model is being seen as an essential development to fully utilise remote locations of their specialties, maximising outputs, and regional growth to achieve sustainability. Páirc na Mara will need all stakeholders working collectively to support one another which is evident in literature involving innovation centres. The success of this implementation can lead to sustainable economic growth for regions while enhancing job creation prospects.

From all these issues the lack of infrastructure requirements is the biggest obstacle the development faces. Much of the region is operating with poor roads, low transport links in regard to bus routes and significantly below EU average broadband which are vital for business in the current market. For the Páirc na Mara development installing a high standard of broadband should be a main priority as following on its implementation, marketing and promotion will allow for additional industry developments to occur. These processes are digitalisation and smart specialisation which have grown in popularity in peripheral regions throughout Europe where broadband infrastructure is highly needed. This high-speed broadband is not only needed for business as it is essential for everyday life as society becomes increasingly reliant on the internet for banking, shopping, and education.

Marine produce licensing, regulations, and legal issues were all noted as obstacles being faced by individuals involved in various aspects of marine. Regulation needs to be more dynamic with accessibility and legality difficulties needed addressing and revisions. By not allowing national reform it is detrimental to the national marine interest constricting Ireland as a positive environment for progressive marine activity practice. This can lead to a reduction in foreign direct investment if it is portrayed globally that Ireland is outdated when it comes to deploying new technologies and licensing to respond to fluctuating quotas demand for fisheries. A direct drawback from regulatory issues is the difficulties which marine enterprises face when trying to obtain finance institutions and agencies. Although accelerator and start-up grants are available it can be problematic for marine enterprises due to the nature which funding is allocated, and the long-term vision sought for their development. The risk factor associated with marine enterprises was also a prominent difficulty but if alterations and amendments were made to policy it may create a more positive start-up environment. Policies which need revising from our research is Harnessing Our Ocean Wealth which needs to be viewed in a collaborative manner to adjust the elements which are failing the industries growth and development. A collaborative direction is also needed for the success of Páirc na Mara. The more stakeholders involved the more utilised the centre will become. Literature notes that this can be difficult to overall implement but if the right processes and procedures are established this can be overcome as businesses need all the support available post Brexit and Covid-19.

Education is another challenge for the industries future in regard to the lack of education around marine activities and career opportunities available. These issues need to be overcome for the

enhancement of the marine's reputation and allow for a wider range of individual to get involved and pursue these types of careers. The current perception of the marine industry and roles does not correlate into the career aspirations of students. The concept of marine should be taught to students as intrinsically as Geography, History and Science; by achieving this it would be an essential move forward for Irelands Marine Economy. A previously believed obstacle was the development being located within a Gaeltacht region. This of course was not the case. For readers who may be unfamiliar with Gaeltacht regions, these are regions which is primarily Irish speaking but due to English being the first language of the remainder of the island most areas would be predominately bilingual assuring this potential constraint may not be an issue. A challenge from the location is the regions proximity to an urban centre which is Galway City being its closest at 66 Kilometres of a commute. This is another reason to how vital it is that transport links are invested in as to optimise the number of individuals willing to relocate for job opportunities and to establish and grow enterprise.

Together these results provide important insights into what requirements businesses will need to adapt to a dynamic market environment. The acceleration towards digitalisation for business and adapting new technologies is going to be essential if businesses want to stay competitive. Policy needs to be adapted in line with new innovations taking place worldwide, this will help encourage start-ups while also allowing for diversification and idea generation to occur. This is an important issue for future research in investigating the time which it takes for policy advancements in technology and innovation to reach enterprises to then compete in an additional marketplace. Further research should also be carried out on how procedures such as smart specialisation should be implemented and utilised in rural regions.

2.7. Conclusions:

The objective of this research was to determine the challenges facing innovation and business progression in peripheral regions with the development of Páirc na Mara as a focus. Although the current study was based on a small sample of participants the findings ultimately suggest that for business to develop within peripheral regions and for a landscape for growth and opportunity to occur there needs to be a supportive collaboration among stakeholders. This will involve adapting a coordination within the innovation centre which enables knowledge transfer and idea generation to further grow job opportunities and entrepreneurship. Policy also needs to be explored to assure it is being fully beneficial to rural communities. The findings recommend that strategies are not being funded and implemented in a correct manner which would achieve maximum results. Technological advancements and broadband infrastructure need to be adapted to both enhance competitiveness through digitalisation, smart specialisation to improve economic productivity and to allow the region to become more attractive for relocation in conjunction with the rise of remote working. By investing in technology, it can allow for migration back to rural communities which will lead to economic growth and increased standard of living. The second finding was that The Delphi Method may be the most competent methodology to adopt in a global pandemic. Throughout all national lockdowns the survey rounds were distributed efficiently with an outstanding return response rate. This was primarily due to the method allowing to be completed remotely with email as the primary method for communication which may not allowed for the same results if an alternative type of methodology had been chosen for the project.

Chapter 4: General Conclusions:

The initial double objective of this research was to first identify the international best practice for the development of innovation centres in peripheral regions and second was to outline the sectoral advancements needed for businesses to operate efficiently in rural areas. The research identified the obstacles and challenges which these regions faced and identified solutions to how these barriers may be overcome. From this research several factors and themes have become prevalent for the development of peripheral regions. The first chapter of this research paper examined literature concerning rural development and innovation centres and the activities and processes which needed to be in place for sustainable growth to occur. The second chapter involved using a qualitative research technique known as the Delphi method to conduct rounds of surveys with participants involved with academia, industry, government and community on various topics which were affecting the marine sector and business development in peripheral regions until a consensus was reached.

Suggestions for Policy Makers:

From the review of literature in chapter 1 several themes were noted as being essential for rural development to occur. These were policy intervention and regulation, regional capabilities, infrastructure requirements and social innovation. Policy was seen as vital for peripheral regions to create opportunities, for most rural regions who had successfully created growth through in their region having policy which supported them was essential. This was achieved through having domestic policy which has been tailored to align with business development and attitudes and behaviours of the local entrepreneur's management styles. An open policy was found as essential for businesses to be able to cross collaborate between enterprises and stakeholders in the region to create new products and processes. The freedom must be given to entrepreneurs to inspire change within a region and work with additional stakeholders to create a shared strategic vision. The EU strategies of smart specialisation are also seen as being effective for rural development to occur. This requires a region focuses on its strengths, leading to maximum output and increased growth within their region which can have further growth creation through ancillary services. This can also increase the enhanced capabilities of a region which can lead to a strong reputation being built attracting further investment from this type of industry locating here. This is something which can be applied to Páirc na Mara which by focusing on marine and creating an open policy for cross-collaboration among the actors involved can attract further investment to the region by enterprises looking to become a part of this marine cluster in Cill Chiárain.

The research also notes the importance of infrastructure for peripheral regions in the form of housing, transport and broadband. This was something which with Covid-19 has now become more of a focus with the rise of remote working more people are choosing to relocate to peripheral regions as opposed to an urban lifestyle. It is essential that housing is made available, transport links are improved in terms of roads and bus routes operating and broadband infrastructure is fast and reliable enough for individuals to be able to work from home comfortably and not need to worry about connection issues, etc. This is something which has been giving more support in recent months through both the National Broadband Plan, The European Union's Digital Agenda strategy and with the newly issued Governments Remote Working Strategy.

Social Innovation was seen as a strong process for regions to create a change in their environment. This process could take the form of creating any sort of enterprise which would further enhance the quality of lives of its residents. Its formation generally takes stakeholders identifying a need and offering for the members of that locality. It may even act as a focal point for information for the wider locality enhancing the level of community within the region. An example which may occur to residents in Cill Chiárain to serve the influx of workers to the region may be to set up a social enterprise in the form of a café. This would create jobs for locals and would also create demand from local suppliers which may lead to further job creation but would overall bring growth to the region through reinvesting the social values profits back into the region in developing other amenities or services.

Suggestions for Innovation Centre Managers:

On analysis of innovation centres in the literature knowledge transfer collaboration, spin-out enterprise high-tech clusters and the triple and quadruple helix. Knowledge transfer between stakeholders within the innovation centre was seen as essential in idea generation. This was achieved through the stakeholders within the innovation centre having open areas where ideas could be shared, and solutions found. It is essential that face-to-face interactions are common as to strengthen relationships of stakeholders within the centre. This can lead to collaboration between different entities involved within the centre further developing products and services and enhancing the reputation for productivity of the centre. This type of knowledge transfer on its successful application can lead to clusters developing within regions around where the innovation centre or focal point is located. This was evident in the literature which discusses the high-tech cluster of Robotdalen in Sweden and Galway in medical technologies where both through focusing on an activity have become internationally renowned for being a location of idea generation, highly skilled workforce and product development. These types of clusters and advanced skillsets also led to an increase in start-ups from the transferable skillsets these multinationals provided. Several start-up enterprises which were founded especially in medical technologies all had prior experience and skills which were acquired from working within that sector with another company. From being in the cluster in allowed these entrepreneurs to make the connections necessary to support their own business and allowed for them to already have strong connections made with suppliers.

This type of shared knowledge was achievable when a triple or quadruple helix was implemented into the innovation centre. This accumulation of academia, industry, government and community allowed the centre to have these knowledge transfers as they had different actors with a range of different skills and attributes which collectively allowed for a more detailed and strategic approach to idea generation or product creation. By inviting the community to be a part of the operation it could further idea generation and for locals to develop their own start-up enterprises. The success which these innovation centres can bring to a region is evident in Station F, Rúta N and the Barcelona Growth Centre as although they had been in urban areas it still brought a

significant level of growth which can advance social benefits and bring gentrification to areas located in proximity. This is another reason why it is so important for Páirc na Mara once developed to invite all stakeholders involved and assure, they are working towards a shared strategic vision for the innovation centre.

From the second chapter which primarily investigated the challenges which faced the Páirc na Mara development. It in a lot of areas mirrored what the literature had noted. Policy was significant issue with many of the participants involved feeling that it was serving the area or the marine sector the best of its ability and that many of the strategic plans for economic growth and the marine were outdated and not being implemented correctly. All participants were of the belief that for Páirc na Mara to be a success it needed to have the overall support from the stakeholders involved. Infrastructure was also seen as a potential barrier to development with currently poor transport links and broadband capabilities. By implementing these it can enhance the competitiveness though digitalisation and smart specialisation. Workshops were also noted as being essential for the upskilling and training opportunities for locals as to be able to be suitable to work in Páirc na Mara in an array of different marine activities.

This research is important as it will act as a guide to those involved with Páirc na Mara to what further processes are required to assure the sustainability of the innovation centre. The concept of a marine innovation centre being developed within a disadvantaged region is extremely unique for Ireland. By following on the research compiled from the literature it can act as a guide for how to overcome the barriers and challenges which the development may face. It can also take note of the feelings which the participants had in relation to certain topics and by following on answers and opinions given it can align the strategic vision of the centre to assure stakeholders have the resources available to them to confidently generate concepts and ideas while also allowing them a platform to reach out to other stakeholders if they are in the need for help or assistance. The rural development concept of the research I feel is important as it is vital that from the beginning of the development that social innovation needs, and capabilities being developed are monitored as to assure that the region can attain the most growth opportunities possible. An additional feature of the research is the accelerated factors brought from Covid-19. It is more important at present that these types of peripheral regions seek the infrastructural requirements needed to allow for regions to be as attractive as possible to those who may be given the opportunity to work remotely and relocate to a more rural landscape.

Future work:

On further study it would be interesting to research the additional needs which those looking to relocate in peripheral regions would require. Throughout this research, Ireland was in lockdown with restrictions on movement nationally. It would be interesting to conduct studies with those who have been given the opportunity to remote work and look for what developments that would be needed for the region to possess. The concept of remote working is still a very new subject but to explore this would be interesting to identify further what amenities need to be put in place. It would be also interesting to analyse whether this could be aligned through various new types of social innovations to create added value and attraction to the region.

Limitations of the Study:

A key limitation of the research relates to the number of participants that took part in the Delphi study. Ideally, having more participants would have added to the strength of the results from the study.. Increasing the number of participants was found difficult at the time, within the Covid-19 landscape, as the Delphi method requires a consensus to be met, and there is a need for regular contact with participants. More participants would have resulted in a longer data collection phase beyond the timeframe allocated to this research as part of the Masters programme.

Another limitation of the research relates to the relatively lack of literature available on the concept of innovation centres established in peripheral rural regions, especially in the area of the marine. This was mainly due to the vast number of developments of this nature being established in areas with an existing level of adequate infrastructure and population available to assure the innovation centre functions successfully.

A further limitation to the study, but one which could not have been helped due to the obvious circumstance of the pandemic, was the ability to establish research networks with other researchers working on this area. At the starting point of the research, a key feature of completing good quality research would be participating at conferences and other events in order to link with other academics, discuss different features of rural development and innovation. Although some of these events were conducted online, it would have been more beneficial to partake in these events in a face-to-face setting and be given the opportunity to meet other likeminded researchers. These meetings and discussions may have led to the research taking a different direction or further exploring different topics and areas.

Implications/Recommendations for Policy and Practice:

In terms of recommendations for policymakers, there are numerous issues that should be resolved and practices that should be developed for the Páirc na Mara development to be a success. The first element is the establishment an area within the facility for cross collaboration. In a significant amount of the literature, the importance of these types of interactions have been highly noted as an intrinsic process for idea generation and innovation to occur (Walsh, 2019; Morrison, 2018; Ryan & Giblin, 2012; Giblin, 2008; Ali et al, 2020; Hasche et al, 2020; Autio & Levie, 2015). It is important that this is taken into account in the planning process and located where it will yield optimum cross collaboration between the stakeholders involved with the triple and quadruple helix based within the Páirc na Mara development. This can further lead to ancillary services being developed and job creation being deployed in the Cill Chiárain region.

The smart specialisation strategy also needs to be applied to the region with production being optimised. From the literature and the experience in other regions, this process has been effective in creating growth, but also enhancing the capabilities and the ability to create clusters in a region. Social Innovations are another sizeable method of regions creating jobs. This should be particularly important in the development of Páirc na Mara where there will be an influx of new businesses locating and looking for new types of ancillary businesses to support them. This could be a range of different activities from printing services to hospitality services. It is

important that the region constantly meets and tries to identify new ventures which may be feasible and enhance the quality of life for its residents.

Infrastructure developments also need to be increased if the region is to be competitive with its urban counterparts. The increase in remote working and technological advancements in industry mean that enterprises need to have every advantage available to them. Businesses will not accept being situated in a location with inadequate internet speeds and will relocate in order to obtain maximum speeds and accessibility. It is important that these types of soft infrastructure are ensured from the beginning to attain a reputation as a high-speed broadband facility which can handle any type of industries online demands for upload and download speed. Other infrastructure such as housing and transport needs to be assessed and planned for along with the development of the project, but it is vital that the level of commuting to the facility is monitored to facilitate sustainable transport options and additional residential areas to ensure the overall sustainability of the region and to add to regional economic growth.

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Appendices:

1 Marine Economy Development: Round 1.

Introduction:

Thank you for agreeing to participate in this study.

Marine Economy Development: Identifying opportunities and challenges for business development in coastal peripheral regions is concerned with identifying the key areas of importance surrounding the Páirc na Mara development in Connemara.

This questionnaire consists of two sections. Section 1 includes three background questions which will provide us the context for analysing your responses. Section 2 presents 17 statements for which you are asked to select the extent of your agreement with each of them. After each statement, you are asked to give more details.

Results from this questionnaire will be part of a Masters thesis dissertation and a research report. If you are interested, we can send you a copy of the final report.

Your responses will remain confidential and will not, at any time, be disclosed to other participants in this study. You will receive the results from this questionnaire at round two of the study.

Thank you for your time and assistance.
Cathal Shanagher, Researcher.

Background Information:

Páirc na Mara is proposed as Ireland's first dedicated Marine Innovation Park. Páirc na Mara will be developed as a state of the art, low carbon, Marine Innovation Park, located on a greenfield site on the southern edge of the Connemara Gaeltacht approximately 45 miles west of Galway City. The site which will accommodate the Marine Innovation Park comprises approximately 9.01ha and will encompass a variety of marine related activities, where productive sector enterprises, public bodies, state development agencies and the research community will work together to add value to their products and services and to maximise the development potential of the marine sector in the region.

A key element of Páirc na Mara is with the Marine Innovation and Development Centre (MIDC) which is being championed by Údarás na Gaeltachta. The development of a market-focused Marine Innovation and Development Centre (MIDC) at Páirc na Mara, will be a dedicated marine development campus, the first of its kind in Ireland. The project will provide 1,800 sq. mtrs. of enterprise and incubation space for marine enterprises. Through collaboration with regional stakeholders and the HEIs, the project will provide specialist training and business development supports.

By completing the survey below, you agree to the consent form attached in the email.

* Required

1. In what capacity are you responding to this questionnaire? *

- [ ] Industry
- [ ] Academia
- [ ] Community
- [ ] Government

2. What organisation, if any do you represent?

3. What sector would you place your interest in? *

- [ ] Seafood
- [ ] Marine Renewable Energy
- [ ] Marine ICT
- [ ] Biotechnology
- [ ] Marine Manufacturing and Engineering Services
- [ ] Tourism in Marine Areas
- [ ] Offshore Oil and Gas
- [ ] Academia, Research and Education
- [ ] Government & Public Service
- [ ] Marine Commerce and Ship Leasing
- [ ] _____

Other

4. Potential Industries *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
There are other types of industries outside of the marine which I could foresee setting up in Páirc na Mara.	○	○	○	○	○

5. Please provide a reason for your response.

6. Infrastructure Requirements *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
For sustainability to be achieved increased infrastructural requirements are needed, such as increased frequency of bus routes to neighbouring towns and villages.	○	○	○	○	○

7. Please provide a reason for your response.

8. Local Workshops *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
There is a need for Entrepreneurial Workshops in the area, as a means to increase confidence for social innovation and social enterprise.	○	○	○	○	○

9. Please provide a reason for your response.

10. Gaeltacht Area *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
The Páirc Na Mara innovation centre being located in a Gaeltacht area may act as a deterrent for businesses to relocate within the area.	○	○	○	○	○

11. Please provide a reason for your response.

12. Upskill Requirements *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Relevant training should be put in place to upskill the local workforce to meet the new job requirements.	○	○	○	○	○

13. Please provide a reason for your response.

14. Harnessing Our Ocean Wealth *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Ireland's integrated marine plan 'Harnessing Our Ocean Wealth' and associated activities such as the National Planning Framework are doing all they can to achieve sustainable development for the ocean economy.	○	○	○	○	○

15. Please provide a reason for your response.

16. EU Policy Incentives *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
EU policy incentives are equally distributed in both urban and rural areas.	○	○	○	○	○

17. Please provide a reason for your response.

18. Government Policies *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Reductions in certain taxes such as the Corporation Tax should be given to businesses looking to start up in disadvantaged areas like Cill Chiaráin.	○	○	○	○	○

19. Please provide a reason for your response.

20. Housing Infrastructure *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
For the long term sustainable development of the area, additional housing should be provided.	○	○	○	○	○

21. Please provide a reason for your response.

22. Financial Aid *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Financial aid for emerging businesses in the marine sector is obtained with ease.	○	○	○	○	○

23. Please provide a reason for your response.

24. Marine Produce *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
There can be accessibility, regulation and legal issues associated with products that originate in the ocean e.g Seaweed/Seafood.	○	○	○	○	○

25. Please provide a reason for your response.

26. Export Capabilities *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
There are adequate training supports for indigenous companies to adapt to exporting their products into a global market.	○	○	○	○	○

27. Please provide a reason for your response.

28. Industry Developments *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Smart Specialisation* and Digitisation of industry is promoted currently for businesses in rural areas. *Refers to an innovation policy concept that aims to boost regional innovation, contributing to growth and prosperity by helping and enabling regions to focus on their strengths.	○	○	○	○	○

29. Please provide a reason for your response.

30. Graduate Relocation *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
There is appetite among newly qualified graduates to move to rural areas such as Cill Chiaráin.	○	○	○	○	○

31. Please provide a reason for your response.

32. Graduate Expertise *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Graduates lack certain skill sets required in order to start their own business in marine-related industries.	○	○	○	○	○

33. Please provide a reason for your response.

34. Stakeholder Collaboration *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
More involvement is needed from Academia, Industry and Government for Páirc Na Mara to reach its full potential.	○	○	○	○	○

35. Please provide a reason for your response.

36. School Education

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Education given to students in primary and secondary schools about marine related courses and job possibilities is sufficient at present.	○	○	○	○	○

37. Please provide a reason for your response.