"EUROPEAN SPACE AGENCY BUSINESS INCUBATION CENTERS'(ESABIC) DYNAMIC CAPABILITIES, ENTREPRENEURSHIP ACTIVITIES AND VALUE CREATION WITH STRUCTURATION THEORY APPLICATION:A MIXED METHOD STUDY WITH MACHINE LEARNING MODELING"

Research Paper

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Abstract

This study investigates the specific capabilities of University Based European Space Business Incubators Centers(ESABIC) that enhance entrepreneurial activities,value creation and the regional influence and impact on them.
Using identical and purposive sampling schemes and designs, specific ESABICs (substantive and dynamic capabilities) are identified and the impact of external conditions such as regulations, constraints and challenges on the ESABICs socio human structures are also investigated. The study is designed based on a Sequential Exploratory Mixed Method Design. Qualitative thematic coding was applied in the first stage to extant studies in Space Based literatures. Themes, patterns, study concepts and pre-conceptual framework were identified and designed. Using the outputs from the first stage, quantitative modeling from survey will be further used to develop measurement metrics for ESABICs and also predicting the relative effect of the dynamic capabilities on value creation.Comparisms will also be made with traditional UBIs.This study contributes to research on dynamic capabilities and entrepreneurship ecosystem of UBIs by using a multi-dimensional approach to dynamic capabilities assessment. It also enhances the application of Mixed method research methodology in UBI studies by highlighting the procedural steps for data integration and the final results and reports will be made using Mixed Method Standard Practices such as GRAMMS.

Keywords: University Business Incubators(UBI), European Space Agency Business Incubation Center(s),ESABIC, Sector focused (or) specialized University Business Incubators.

1 Introduction

UBIs are embedded within regional entrepreneurial ecosystem(EE) to foster knowledge generation, diffusion and to stimulate entrepreneurship culture and climate(Etzkowitz, 2002; Bruneel *et al.*, 2012; Soetanto and Jack, 2016). UBIs perform these activities by absorbing resources and using their internal and external capabilities within their EE and trans-regional environment to aid knowledge generation and diffusion(Brown and Mason, 2017; Malecki, 2018). Some UBIs engage in advanced

and multi-dimensional roles within their regions as sources of knowledge generation and diffusion by engaging with stakeholders within these regions in knowledge exploration and exploitation as part of the regional innovation subsystem component(Cooke, 2001; Asheim and Coenen, 2005). While UBI studies have emerged and transited into different forms based on different regional contexts, some sector focused UBIs configuration have also emerged due to the substantive regional infrastructure,the resources available within the ecosystem and the continuous recombination of their capabilities(Hughes, Ireland and Morgan, 2007; Wang and Ahmed, 2007; Rasmussen and Borch, 2010; Lagos and Kutsikos, 2011; Obaji, Olugu and Obiekwe, 2015; McAdam, Miller and McAdam, 2016; David-West, Umukoro and Onuoha, 2018) and their incubation models should be adapted to suit the regional context.

In line with this, sector focused UBIs have emerged as a form of UBI. These UBIs specialize in industries such as Space and Satellite, Biotech, Medicine, Pharma(Cooke, 2001),Fintech, Insurance, Cybersecurity, Robotics, Agrotech(Taiwo, 2023)and Artificial Intelligence sectors. Corroborating the Triple and Quadruple helixes, these UBIs together with firms and industries within their region have created specific sector focused clusters for spinoffs and entrepreneurial activities(Asheim and Coenen, 2005; Cooke, 2013) with differing incubation models and capabilities due to the dynamism within their regional ecosystem and global industry. This study discusses the business incubation centers in the space industry.

Due to the disruption in the Space Business, vertical integration and effect of new entrants into the markets, the ESA (European Space Agency) instituted business incubation centers (called ESABIC) to facilitate the realization and commercialization of space based ideas and research in the EU member states. These ESABICs are either located and in association with Universities or Private organizations.

To facilitate the integration of these ESABICs, the ESA established innovation venture offices, technology transfer program office, network partnership initiatives, broker support(Technology and market) and radical innovation initiatives. These venture based offices in line with the member states developed the ESABICs selection processes, tendering and agreement. While each ESABIC has its autonomy in developing its network of collaboration and partnerships within their ecosystem, the space industry is well regulated and there are policies enacted by the EU (European Union) based on the Lisbon Treaty guiding the ESA and ESABICs entrepreneurship activities(Moranta and Donati, 2020; Eldering and Hulsink, 2021). While there are constraints and impacts of regulations and policies on the ESABICs entrepreneurial, innovation and value creation, the BICs are saddled with the responsibilities of adapting, adjusting and combining their internal and external capabilities coupled with the clusters or ecosystem initiatives in combating the effect of external pressures and impact on their socio-human structures.

Based on an explorative and predictive research objective, this study aims to firstly understand the specific ESABIC capabilities (substantive and dynamic) that aids entrepreneurial activities and value creation within different regional context and secondly based on qualitative thematic analysis, this study identifies related themes and concepts on ESABIC socio-human structure and how they adapt to crisis, tensions, disruptions and challenges based on a multi-dimensional level. This study will contribute to UBI literature by corroborating earlier theories that UBIs specific capabilities should be identified and adapted based on regional contexts and further enhances the application of socio-human structure such as SST (Strong Structuration Theory) theories to UBI studies(Taiwo, 2022).

While venture firm' capabilities aid their business value delivery across the product or service value chains, these capabilities undergo recombination, re-integration or retirement based on the firm's capability life cycle(Wang and Ahmed, 2007; Teece, 2017). The clusters and the regional ecosystem in which these ESABICs, UBIs and startups are embedded also undergo recycling and transformation(Newey and Zahra, 2009; Brown and Mason, 2017; Spigel, 2017). Owing to these dynamism, the structures and the recursive relationships between the active agents are impacted. How these structures evolve with these capabilities and the social interactions dynamisms and linkages that aids trust development and entrepreneurial partnerships and collaborations requires further studies(Taiwo, 2022). Consequently, an application of the SST and its methodological bracketing

(temporality) gives a foundation to understand the impact of external conditions on a typical specialized focused UBI ESABIC. The study intends to find answers to the following underlying research questions: what specific ESABICs capabilities embedded in a regional context are needed to facilitate entrepreneurial activities and value creation overtime? and how do ESABICs align to external impacts and constraints on a multi-level analysis overtime?

In this vein, there is a dearth of UBI studies on the dynamism of specialized focused UBIs (in this case ESABIC) capabilities overtime and their changing ecosystem dynamism and evolving social networks with the socio-human structural impact. This study intends to bridge this gap by adopting a pragmatic research worldview or stance and adopting a sequential exploratory mixed method design which aids the combination of the benefits of both positivism and interpretivism(Creswell, 1999; Cameron and Molina-Azorin, 2010; CRESWELL and CLARK, no date). This study combines the benefits of qualitative research technique using thematic coding and analysis with survey and quantitative analysis and statistical modelling with machine and deep learning for predicting,backcasting and forecasting the effect of UBI capabilities on their entrepreneurial activities .

This study also aims to enhance the use of mixed method research design in UBI studies due to the low absorption of the mixed method research design in UBI studies by highlighting the procedural and reporting format or standards in mixed method research(Johnson and Onwuegbuzie, 2004; Creswell and Tashakkori, 2007; Cameron, 2009). The next sections describe the ESABIC study framework and pre-concept, methodology description, analysis of the themes, categories and patterns and discussions on the ESABIC cases.

2 ESABICs Introductory Framework and Conceptual Guide

ESA(European Space Agency) the governing body for satellite and space based business activities and launch in the EU triggered business incubation activities based on recent market disruptions with the establishments of Business Incubation Centers(ESABICs) in member states countries. These ESABICs are saddled with the responsibilities of generating, facilitating and commercializing space based ideas. With the partnerships of their ecosystem consisting of inter-firms, public and private actors and ESA based NPI (Network Partnership Initiatives)(Szalai, Detsis and Peeters, 2012; Eldering and Hulsink, 2021).

An initial regional selection tendering is used before ESA selects the regional and country representative. Based on the final selection, agreements are established with ESA based on negotiable terms. Due to this, there are variation in the regional and country ESABIC representatives' member characteristics.

Each ESABIC is saddled with the responsibility of facilitating the regional capabilities within its ecosystem to enhance space technology transfer and spinoffs by using its internal capabilities in creating business value in segments such as earth navigation and observatory, weather reports and car navigation and fleet management systems. ESABICs facilitate the business incubation activities via different processes. Open innovation is largely encouraged by ESA with market pull and technology push strategy. However, there are reported constraints due to one-directional information flow during open innovation activities. In this case a bi-directional open- innovation process is preferred. Government involvement due to policies and regulations are also important factors for consideration as this impact entrepreneurial activities within the ESABIC and startups. Other bottlenecks and challenges that impact ESABICs include: competitions and rivalry and information leakages. This study will examine how ESABICs and startups adapt and respond to these challenges(Goehlich *et al.*, 2005; Moranta and Donati, 2020).

A sum of minimum €25000 to €200000 is awarded to selected startups in member state countries depending on the competitive landscape and the tendering and agreement deals with ESA. Generally, ESABICs can focus on any aspect of the value chain however according to reports, the upstream segment is the synochure of most investors. There are also growing focus in other sectors where space

data could be applied such as Tele-medicine, healthcare, GIS (Geographic Information Science) and Agriculture.

The ESABIC pre-conceptual framework and study concept developed are shown in figure I

3 Methodology

Core related articles that discussed ESA and ESABIC entrepreneurial and business incubation activities were coded. The themes,patterns and categories were identified and a conceptual framework was developed based on the resulting themes.The conceptual framework highlights the triggers,drivers of business incubation activities by ESA that led to the formation of ESABICs,the structure of ESA that aids the business incubation and tech transfer activities,the constraints and challenges faced by the ESABICs and startups and the ESABICs network relationships.

Based on sequential exploratory mixed method research, qualitative technique was applied in the first stage using thematic coding and analysis. The themes and patterns are identified and categorized based on the coded articles as shown in Figures 1. The interrelation between some of the codes is shown with Sankey diagram in Figure 2.

A survey was also generated based on the categories identified and sent to the ESABICs to ascertain the degree of each underlying capabilities. Further research would also include other ESABICs in which research techniques such as QCA (for analyzing organizational configurations based on equifinality, asymmetry and conjectures and the set theory), hierarchical clustering with statistical modeling and predictive analysis using Machine and Deep Learning (ML and DL) will be conducted for quantitative analysis.

The categories identified are: ESABIC Business and structures with sub-categories-ESA as an organization,ESA emergence, Organizational structures,Stratetegy and Value Chain,ESABIC Entrepreneurial Activities,Value creation and Capabilities and Knowledge and Innovation in EU Space Business.The next categories identified are: ESABIC Business Incubation and Spinoffs with sub-categories-ESA Space Business and Tech transfer activities and Space Sectors Startups and Spinoffs.The last category is Space Business External factors and Impact with sub-categories: Challenges and Tension in ESABICs with sub-categories-Government Roles,regulation and policies. Based on these categories and sub-categories, an ESABIC pre-conceptual study framework was developed as shown in Figure 1 by taking into consideration regional characteristics and context. The combined integrated framework and the categorized emerging patterns and coding served as a platform in developing a holistic and comprehensive overview for ESABIC UBI studies and for the case interviews.Figure 1 and 3 highlight the conceptual framework and thematic coding analysis.

4 Analysis of Thematic Patterns and Categories in ESABICs Studies

The themes and patterns are classified into three major categories: The first category is Space Business organization components and Structure. Under this category, the following sub-categories exist: ESA and ESABIC structure, knowledge and Innovation(flow), in ESABICs, Value Chain and Strategy, ESABIC Space Business Entrepreneurial Activities, Value Creation and Capabilities.

The second categories of codes are grouped under the theme Space Business Startups and Spinoffs and the following sub-categories exist: Space Business Funding and Investment, Tech Transfer and Market Strategies, ESABIC Value Chain, Knowledge and Innovation in Space Business and Partnerships and Interactions in ESABIC.

The third categories of codes are grouped into the theme ESABICs External Factors and Impacts Crisis, Challenges and Constraints. Sub-categories under this theme include: Government roles, regulations and policies impact on space business in EU, Challenges and Tensions in Space Business.

These categories and themes identified coupled with underlying theories such as knowledge and spillover theory, Innovation theory, Entrepreneurial Activities and Value Creation, Porter' Diamond

Model Dynamic Capabilities Framework and Strong Structuration Theory (SST) will be used to enhance further analysis of the framework and concepts of Business Incubation within ESABICs.

The next section discusses the categories in relation with the two cases.

5 Description of Categories and Application to Cases

5.1 Category A-ESABIC Business Components and Structure

ESA's aim in enhancing Entrepreneurship along the value chain segment of the space industry was triggered due to the disruptions, new vertical integration and new entrants into the space business.

Due to the new dynamism in the value chain, BICs were instituted to foster co-operation within the member states ecosystem, enhance co-operation for Research and Development (R &D) and regional incubation activities. To achieve this aim, ESA established entrepreneurship arm and structures to facilitate incubation activities. This include creation of the Innovation Venture Office to aid startup activities, the Broker network for Technology and market brokerage support along the value chain, the Tech Transfer Program Office to facilitate Space technology transfer commercialization from independent firms, new ventures and the academia and lastly the Network Partnership Initiatives and the Radical Innovation Initiatives for project collaborations and open innovation.

As at 2023 there are several ESABICs spread across Europe with some member states like Finland and Germany having more than 3 ESABIC locations. Some of which are well integrated with Universities Business Incubation Activities. It is pertinent to note that ESABICs are be located around Universities or private organizations.

With regards to funding, ESA has a standard funding support for members' states which ranges from €25000 and above. However, each member state has the autonomy to develop several network of partners within their ecosystem for incubation activities support and investment to aid the entrepreneurial activities.

5.2 Category B-ESABIC Entrepreneurship Activities and Value Creation

Taking a look at the value chain of the Space Business the startup incubation activities depend on the localized member state capabilities, competencies and market strategy. One of the interviewee (Case A) corroborated this during the interviews that 'due to the existing regional infrastructure and strong academic research background and industry alliance, we co-create and operate on open innovation with space related firms. Our academic and research relationship with the central ESABIC has also helped in facilitating the establishment of the Space startup within our University and Region'.

Case B highlight a highly competitive Space Business Ecosystem. Being the central and the only ESABIC in the country the initial establishment by ESA was via a competitive tendering and selection process from all regions in the country before the establishment of the ESABIC was awarded to the region due to its established space research facilities and connection with the subject experts in the industry. A flourishing ecosystem of startup activities in major sectors also aided the selection of this region by ESA.

The Space startups selection for this ESABIC involves high competitive selection criteria as only about five percent of startups are selected in the final round (3 out of 60 applications). Some of the criteria used in the selection include: innovativeness of the startup, team formation and experience in the local market. In general, ESA major goal in promoting and fostering Space Business Incubation activities is based on Open Innovation which provides a consensus and innovative platform for co-evolution and co-creation with actors in the space industry. While the open innovation process could be outbound-In or inbound-out depending on the market strategy also employed (in this case a Market Pull and Technology Push Strategy) where opportunities within the Space industry are scanned and developed while also seeking for applications of the space related technologies and downstream

segment to other sectors of the economy. The two cases showed a divergent degree of concentration in the Space value chain. Case A focused on the application of the Space data to Artificial Intelligence (AI), Geography Information Science (GIS) via co-creation collaborative activities and projects with entrepreneurs and space firms (Waste and Energy Industry), while Case B focus on the whole Space Value Chain depending on the availability of ideas from the startups.

As already asserted with traditional UBIs, the capabilities required for idea commercialization and incubation activities also differs in the two cases. Firstly, due to the different regional innovation systems in which the ESABICs are embedded and differing attributes within their ecosystem which they absorb in creating their entrepreneurial and idea commercialization activities. Case A ESABIC being newly established is located in the peripheral of the Northern part of Europe whose dependency on innovation connection with cross border regions and countries is vital for its entrepreneurial activities while still connected to an already functioning central central ESABIC.

This central ESABIC has an already substantive strong academic research infrastructure and pedigree in Space and other segments gave this ESABIC a leverage in its business incubation activities. In enhancing further development in the space segment value chain, Case A ESABIC partnered with a neighboring country for entrepreneurship activities in the Upstream Space segment.

Based on the initial assertion from literature and corroboration from the interview, a proposition is made.

Proposition I. Different ESABICs have different substantive capabilities that aid their entrepreneurial, open innovation activities and value creation which evolved to dynamic capabilities due to their leverage on substantive regional ecosystem attributes and networks.

5.3 Category C: External Factors and Impact on Space Business

Based on the qualitative analysis and patterns, external impacts on the Space Business and ESABICs are from Government policies, regulations, leakages in the Startups Space Business information due to competition and also constraints in the knowledge and information flow.

Government roles include policy institution and support programs within the member states. The support and partnership programs are instituted via the NPI (Network Partnership Initiatives), however tensions based on policies impacts, open innovation constraints and one-directional knowledge and information flow initially impeded value creation. In response to this, some ESABICs have evolved into bi-directional information and knowledge flow during open innovation activities. As the interview participants highlighted, in case B a level of perseverance and resilience from ESABIC and entrepreneurs is required to overcome the disruption in the space industry, while Case A pointed out that a high level of commitment and motivation is by entrepreneurs and startups to accomplish their desired entrepreneurial goal via the completion of the innovation funnel and incubation model or process and activities. Case A also stated that ESABIC requires competencies and capabilities of understanding the market demand and opportunities and aligning their internal strategies and capabilities to meet these demands. In other words, a level of opportunity identification, recognition and development is needed in enhancing and exploiting the opportunities available in the space business.

Application of a structural theory to this Space Business Tension and external impact would aid further understanding of the degree and impact of disruptions within the ESABIC and the responses of the respective actors within the ecosystem. In this vein Strong Structuration Theory is applied to understand the external conditions of actions on the ESABICs Socio Human Structure and the Internal conjectures and disposable skills by the actors shown in response to these challenges and external impact. In addition to this the Resilience theory enhances the understanding of how individuals and firms should develop resilience and adapt to challenges and disruptions cognitive, psychological, structural(organization) and relational levels.Figure 1 also shows the socio human structural analysis based on SST.The constraints,external and internal structures of the ESABIC are also highlighted.

Based on this categorization of themes and patterns and the underlying theoretical assertions, further propositions are made:

Proposition II. Internal capabilities such as opportunities identification and exploitation and specific market strategies are required by ESABICs (managers) for business survival and sustainability, while an entrepreneurial mindset and high level of commitment is required by entrepreneurs for business incubation success and survival.

Proposition III. External impact, tensions and challenges on ESABICs require a level of perseverance and resilience from actors within the ecosystem for venture survivability, while a level of motivation and self-efficacy (Can do mentality) is required by entrepreneurs in the face of opposition and challenges.

Based on the themes that ensued during the coding and these propositions, qualitative interviews and survey was prepared (as shown in Table 2) to examine the different capabilities from ESABICs. This study will take the case of other ESABICs in the Northern and Western parts of Europe in different regional contexts.

6 Case Discussions

Two ESABICs were selected for study. Table I describes the characteristics of the ESABICs. Due to the fact that different regional contexts is needed to justify earlier asserted theory that no one cap fits all in regional entrepreneurship ecosystem development, cases were selected based on different regional modes, types, need and attractiveness. Sampling design and schemes used are Identical (for both mixed method stages) and purposive sampling schemes based on the available cases and fit for the research objective and questions.

Case A is an ESABIC located within a University in the Northern part of Europe. It is characterized by a thin RIS or peripheral region and in the Western part of the country. The ESABIC ecosystem is characterized by a viable and strong research and academic competencies and capabilities and links to the central ESABIC within the country with a pedigree in Space Business.

Case A incubation activities are based on the platform of open Innovation and co-creation of space based project. Established industries in Waste and Energy collaborate with the entrepreneurs and the University based ESABIC for projects in Space related value chains and segments. While still a young but vibrant ESABIC, case A strength in enhancing space based entrepreneurship activities and value creation is based on the level of partnerships and network linkages within its ecosystem and neighboring region and trans region. In ensuring successful startups survivability and entrepreneurial activities, the entrepreneurs pass through an innovation funnel designed by the ESABIC which requires high level of commitment,entrepreneurial mindset and self-efficacy. Motivation is also important for the entrepreneurs in facing challenges during the incubation activities. The ESABIC' opportunity exploration and exploitation strategies and ability to understand market demand are also essential for the space business survivability.

Case B is an ESABIC from Western Europe with a thick regional and robust ecosystem. The region boasts of a strong network of venture capitalists and investment funds. The region is well connected to world top class research universities in the space sector and other industry segments. The initial tendering and selection of a regional and country ESABIC was competitive owing to the outstanding existing regional competencies and capabilities a viable startup ecosystem, regional infrastructure support and a strong academic and research system which the ESABIC leveraged on. This also supports the Porter Diamond Model for Regional Innovation System formation.

The Presence of Space experts and network of partners in the Space business enables this ESABIC to establish a highly competitive Space startup ecosystem. The ESABIC' location in a major startup bustling ecosystem in Europe coupled with Universities known for tech transfers and spinoffs were essential in creating entrepreneurial success and value. Value creation is further created via quarterly network partnerships meetings and conferences with neighboring countries. However, disruptions in

the Space Business especially new entrants in space value chain segment have created further challenges. A level of perseverance and resilience is required in combating this constraints and challenges.

6.1 Initial Findings and Further Research Agenda

From the case interviews, it can be induced that there are variations in the capabilities required by different ESABICs during each stage of the incubation process and model this is due to the regional context in which the ESABICs are embedded. This also dictates their incubation model and idea generation and commercialization activities and vis-à-vis entrepreneurial activities, specialization in the space segment value chain and value creation. Therefore based on the research questions(what specific ESABIC capabilities enhance entrepreneurial activities and value creation and how ESABICs and their stratups respond to impact or constraints).The following findings are depicted from the qualitative study:

In case A ESABIC, due to thin regional embeddedness flourish with open innovation and focused on the downstream segment and applications of Space data to other sectors based on its available substantive capabilities and dynamic capabilities it possesses. While it uses its network capabilities and earlier established substantive capabilities with a neighboring country to collaborate in the upper stream of the space segment for value creation.

Case B ESABIC region has established dynamic capabilities in spinning off startups in several industry segments due to the region's robust network of high-tech actors and investors. This made it easier to easily develop the needed substantive capabilities (e.g. Universities links for space idea generation) for the commencement of the ESABIC space business incubation.

However, for survivability and sustainability of the incubation processes, Case A ESABIC agrees that commitment from incubatees and market strategy and opportunity recognition and exploration process of the ESABIC are essential. While Case B ESABIC, believes that perseverance through the incubation process or life cycle and during challenges are essential for the ESABIC to adapt to external conditions and for business survivability and sustainability.

Based on these initial conceptual framework and qualitative technique findings, quantitative statistical modeling will be applied using Deep Learning to model the behavioral patterns induced from the incubation process and also use Machine Learning to backcast, forecast and predict the sets of capabilities required at each stage of the incubation process. SST temporality and methodological bracketing and dynamic social networks will also be used understand how the actors within the networks and their relationships shift and changes due to the capabilities reconfiguration, reintegration and recombination.

Further research could be conducted in the intellectual properties (IPs) of ESABIC spinoffs and the role of regulation and policies from ESA on knowledge flow and exchanges in ESABICs startups and spinoffs.

7 Quantitative Modeling, Machine and Deep Learning

The initial qualitative findings and results will be further developed by quantitative modelling. The effect of the internal capabilities required during the business incubation lifecycle on the entrepreneurial actitivities on a multi-level analysis will be ascertained. Using predictive statistical tools the multi-dimensional capabilities constructs from the qualitative will be modelled and observed overtime. Furthermore,the behavioural patterns required at each level of analysis that enables the entrepreneurs and ESABIC to adjust to impact will be studied and modelled via deep learning techniques.

7.1 Figure

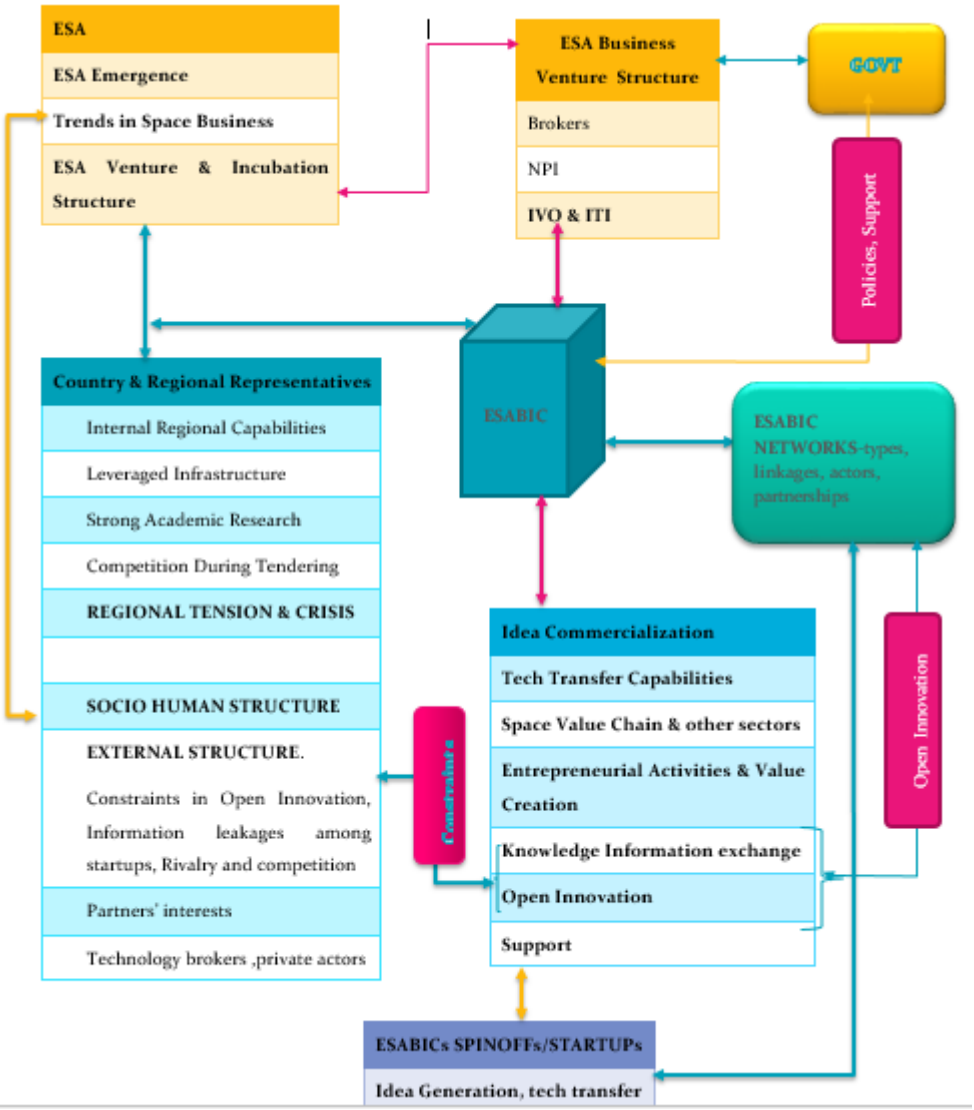

Figure 1. ESABIC Pre-Conceptual Study Framework

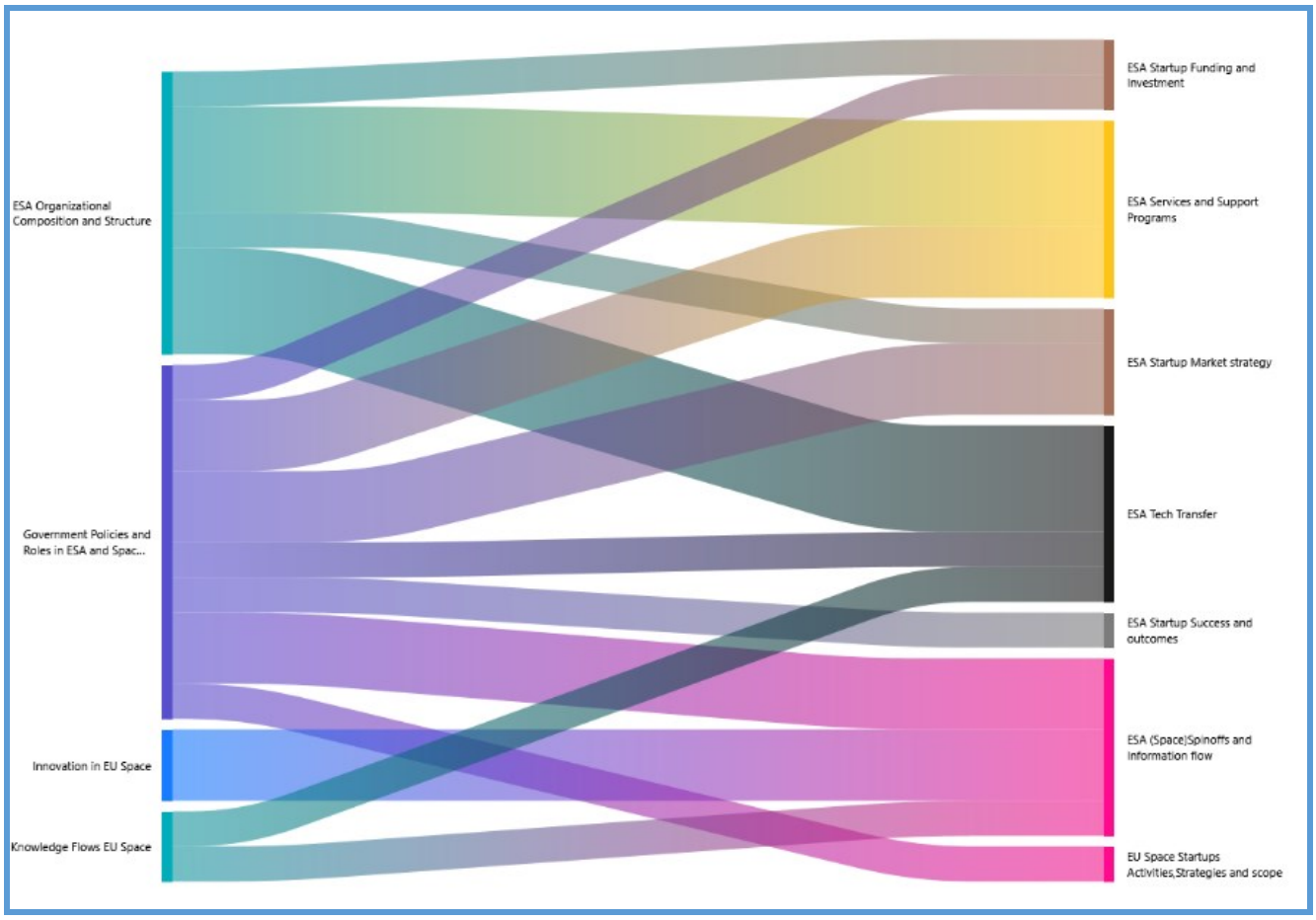

Figure 2. ESABIC Sankey Diagram showing the interrelation of code e.g.Government policies relationships with Tech transfer activities

Figure 3. Categories and Sub-Categories of Thematic Analysis

7.2 Table

Our ESABIC has been able to enhance Entrepreneurial Activities within the region and ecosystem thereby creating more value due to the following capabilities we possess overtime:	Level of Agreement
1 Leverage on Infrastructure, management provisions and human capital: o Readily available regional and ecosystem infrastructures (support system, network etc.) o Space related Academic Research labs o Presence of Space experts and Space labor mobility within the region	o Strongly Disagree o Disagree o Neutral o Agree o Strongly Agree
2 Easily Accessible Funding and Investment: o Easy access to joint funding, investment and VCs in the ecosystem o Sufficient funding from ESA for startups projects o Private Venture Financing (External) o Government (Regional and National) Funding and Investment	o Strongly Disagree o Disagree o Neutral o Agree o Strongly Agree
3 Concentration in this Space Value Chain Segment o Focus on the buildup segment o Focus on Upstream o Focus Downstream o Applications to other sectors e.g. Telemedicine, GIS, Car Navigation System and GPS	o Strongly Disagree o Disagree o Neutral o Agree o Strongly Agree
4 Tech Transfer and Business Incubation Process: o Available Competitive Startups Idea o Opportunity Identification and exploitation competencies o Presence of many new Space startups entrepreneurs within the University and the Region o High level of risk taking and innovativeness displayed by the Entrepreneurs (including students' entrepreneurs)	o Strongly Disagree o Disagree o Neutral o Agree o Strongly Agree
5 Co-creation and Co-production in Space Business o Open Innovation Co-operation o Space Business Knowhow, Knowledge flow & Innovation Business o Open Innovation activities and value creation	o Strongly Disagree o Disagree o Neutral o Agree o Strongly Agree

Table 1. Survey for ESABICs.

Themes	Case A	Case B
Year of Establishment	2023	2017(1st set of startups)
Size and number of ESABICs in the Country	New, 4 ESABICs	Big the only ESABIC in the country
Location	North Europe centered at a University	Western Europe centered at University
Regional Ecosystem Characteristics	Thin	Thick
Localized Regional Capabilities	Strong Academic Research Existing Research labs and Industry	Robust Space Ecosystem and Strong University Research
Internal Capabilities	Connection and strong existing ties to the Central ESABIC in the country.	Highly competitive Startup ecosystem and availability of investment and funding support for innovative Space Business ideas
Ecosystem Attributes	Extended connection to Neighboring country for joint project and research in Upstream Space value chain segment	High network of Partners, Presence of Space Experts and connection to top Universities in the country for Space Business Research
Networks and Relationships	Developing partnership networks	High Network of Partnerships
Organizational Structure		
Space Value Chain Focus	Focus is on project based and open innovation depending on Startups ideas, ESABIC and Industry. Focus is on application of space based data to GIS, AI	Open to all Space segments
Innovation and Incubation Model; **Selection Criteria for Entrepreneurs**	Uses Open Innovation in collaboration with Entrepreneurs and Space Related firms and Industries for projects along the value chain	Tough and competitive selection process based on Team formation, team technology, market focus and registered presence of the firm in the country.
Support Programs	Hackathon Events	Yearly Joint conference with Regional and Trans-Regional network partners
Space Expertise and Labour		
Network Capabilities Competencies		
Funding	€50000	€200000
Adjustment to Challenges		
Critical capabilities for Survival	Commitment and motivation from Entrepreneurs startups for innovation and incubation funnel	Perseverance in the face of disruptions and challenges

Table 2. ESABICs Cases

References

Asheim, B.T. and Coenen, L. (2005) 'Knowledge bases and regional innovation systems: Comparing Nordic clusters', *Research policy*, 34(8), pp. 1173–1190.

Brown, R. and Mason, C. (2017) 'Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems', *Small business economics*, 49, pp. 11–30.

Bruneel, J. *et al.* (2012) 'The Evolution of Business Incubators: Comparing demand and supply of business incubation services across different incubator generations', *Technovation*, 32(2), pp. 110–121.

Cameron, R. (2009) 'A sequential mixed model research design: Design, analytical and display issues', *International journal of multiple research approaches*, 3(2), pp. 140–152.

Cameron, R. and Molina-Azorin, J.F. (2010) 'The use of mixed methods across across seven business and management fields', in. *Justice and sustainability in the global economy: 10th International Federation of Scholarly Associations of Management (IFSAM 2010)*, IFSAM.

Cooke, P. (2001) 'Regional innovation systems, clusters, and the knowledge economy', *Industrial and corporate change*, 10(4), pp. 945–974.

Cooke, P. (2013) 'Life sciences clusters and regional science policy', in *Clusters in Urban and Regional Development*. Routledge, pp. 143–161.

Creswell, J.W. (1999) 'Mixed-method research: Introduction and application', in *Handbook of educational policy*. Elsevier, pp. 455–472.

CRESWELL, J.W. and CLARK, V.L.P. (no date) 'MIXED METHODS RESEARCH'.

Creswell, J.W. and Tashakkori, A. (2007) 'Developing publishable mixed methods manuscripts', *Journal of Mixed Methods Research*, 1(2), pp. 107–111.

David-West, O., Umukoro, I.O. and Onuoha, R.O. (2018) 'Platforms in Sub-Saharan Africa: startup models and the role of business incubation', *Journal of Intellectual Capital* [Preprint].

Eldering, C. and Hulsink, W. (2021) '9. Incubation with space–space for incubation: the European Space Agency's network of business incubation centers', *Handbook of Research on Business and Technology Incubation and Acceleration: A Global Perspective*, p. 160.

Etzkowitz, H. (2002) 'Incubation of incubators: innovation as a triple helix of university-industry-government networks', *Science and Public Policy*, 29(2), pp. 115–128.

Goehlich, R.A. *et al.* (2005) 'Space spin-offs: Making them known, improving their use', *Space Policy*, 21(4), pp. 307–312.

Hughes, M., Ireland, R.D. and Morgan, R.E. (2007) 'Stimulating dynamic value: Social capital and business incubation as a pathway to competitive success', *Long Range Planning*, 40(2), pp. 154–177.

Johnson, R.B. and Onwuegbuzie, A.J. (2004) 'Mixed methods research: A research paradigm whose time has come', *Educational researcher*, 33(7), pp. 14–26.

Lagos, D. and Kutsikos, K. (2011) 'The role of IT-focused business incubators in managing regional development and innovation'.

Malecki, E.J. (2018) 'Entrepreneurship and entrepreneurial ecosystems', *Geography compass*, 12(3), p. e12359.

McAdam, M., Miller, K. and McAdam, R. (2016) 'Situated regional university incubation: A multi-level stakeholder perspective', *Technovation*, 50, pp. 69–78.

Moranta, S. and Donati, A. (2020) 'Space Ventures Europe 2018—entrepreneurship and private investment in the European Space Sector', *New Space*, 8(1), pp. 7–17.

Newey, L.R. and Zahra, S.A. (2009) 'The evolving firm: how dynamic and operating capabilities interact to enable entrepreneurship', *British Journal of Management*, 20, pp. S81–S100.

Obaji, N., Olugu, M. and Obiekwe, B. (2015) 'Business incubation adaptation and success factors in nigerian context of a developing country: A Literature Review', *International Journal of Science Technology & Management*, 401, pp. 1529–2394.

Rasmussen, E. and Borch, O.J. (2010) 'University capabilities in facilitating entrepreneurship: A longitudinal study of spin-off ventures at mid-range universities', *Research policy*, 39(5), pp. 602–612.

Soetanto, D. and Jack, S. (2016) 'The impact of university-based incubation support on the innovation strategy of academic spin-offs', *Technovation*, 50, pp. 25–40.

Spigel, B. (2017) 'The relational organization of entrepreneurial ecosystems', *Entrepreneurship theory and practice*, 41(1), pp. 49–72.

Szalai, B., Detsis, E. and Peeters, W. (2012) 'ESA space spin-offs benefits for the health sector', *Acta Astronautica*, 80, pp. 1–7.

Taiwo, A. (2022) 'STRONG STRUCTURATION THEORY APPLIED TO UNIVERSITY BUSINESS INCUBATORS AND A MULTI-LEVEL ANALYSIS USING INTEGRATIVE REVIEW', *Global journal of Business and Integral Security* [Preprint].

Taiwo, A. (2023) 'University Business Incubators (UBIs) Based Projects in Collaboration with the Academia, Regional Governments, and Digital Innovation Hubs (A Spin-off from DBA Research 2022/23)', *Global journal of Business and Integral Security* [Preprint]. Available at: https://gbis.ch/index.php/gbis/article/view/256 (Accessed: 18 February 2024).

Teece, D.J. (2017) 'Dynamic capabilities and (digital) platform lifecycles', in *Entrepreneurship, innovation, and platforms*. Emerald Publishing Limited.

Wang, C.L. and Ahmed, P.K. (2007) 'Dynamic capabilities: A review and research agenda', *International journal of management reviews*, 9(1), pp. 31–51.