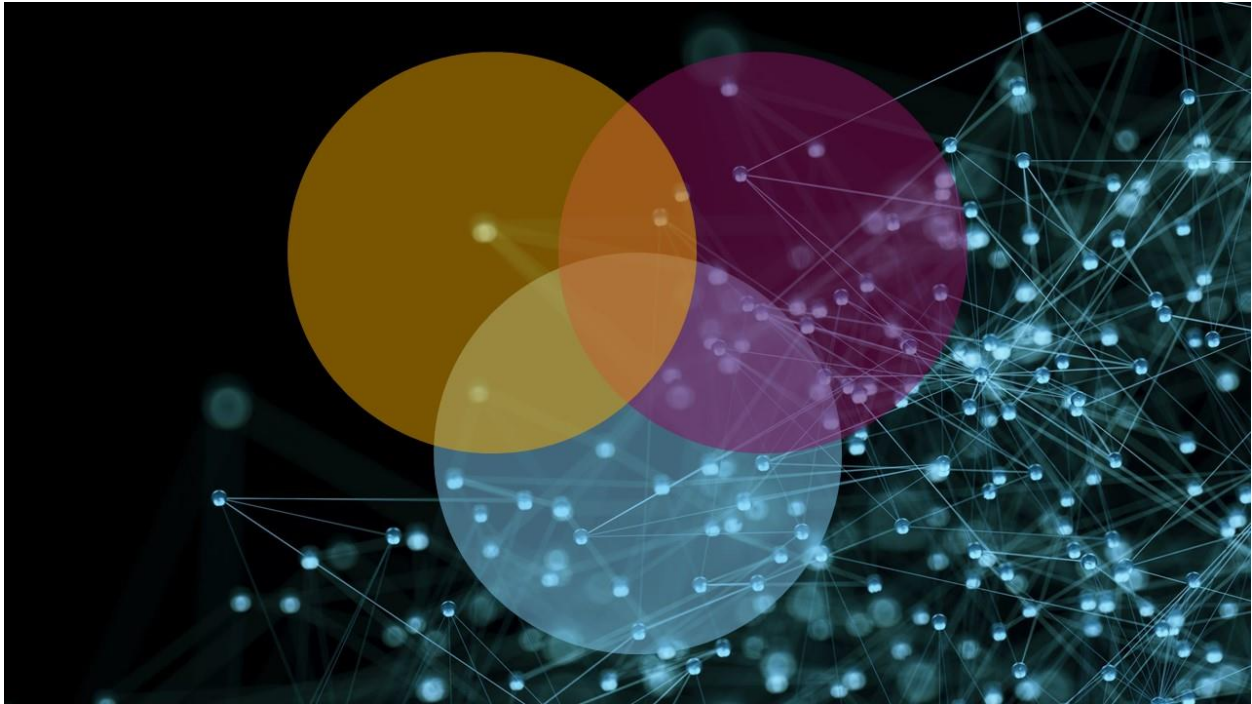




CHALMERS
UNIVERSITY OF TECHNOLOGY



Development of KPIs for an Innovation Initiative between Big Pharma and SMEs

A case study of AstraZeneca's BioVentureHub

Master's thesis in Entrepreneurship and Business Design

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Cover:
An illustration of the interaction between the stakeholders of the BioVentureHub including; the SMEs situated in the hub, AstraZeneca and the funding stakeholders.

Gothenburg, Sweden 2020

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SUMMARY

Global health challenges are in constant need of improvement. The life expectancy and the population is growing, nevertheless, a huge amount of the population dies prematurely of noncommunicable diseases creating a need for new innovative treatments. The life science industry faces two big challenges when trying to create innovative treatments; the difficulty in finding funding, infrastructure and laboratories for small and medium-sized enterprises, and the struggle in constantly innovating and bringing New Molecular Entities to the market for Big Pharma companies at the same time as the cost for treatment is increasing. One initiative created aiming towards helping these actors to catalyze innovation through collaboration is AstraZeneca's BioVentureHub. The thinking behind the hub is to create an environment where small and medium-sized enterprises and a Big Pharma company are co-located and experts within the area have the opportunity to interact with each other and share competence. The goal is to increase the number of collaborations and facilitate a dare to share culture between the actors. The BioVentureHub has existed since 2014, and there is a big interest in understanding the results and outputs from this innovation initiative, and what Key Performance Indicators that are suitable when evaluating an organization like this. In order to investigate what value that has been captured from catalyzing innovation, a literature review and a case study has been conducted including interviews with the key stakeholders of the hub. The findings from the interviews resulted in six categories covering what the stakeholders perceive as the most valuable with the BioVentureHub; Company growth, infrastructure, competence, community, attractiveness, and collaboration. Combining these categories with existing literature within traditional measurement frameworks, innovation- and collaboration performance frameworks resulted in a recommendation of 15 Key Performance Indicators to use in collaborative innovation initiatives between a Big Pharma company and small and medium-sized enterprises. In order to further exemplify the Key Performance Indicators, both hard and soft metrics have been suggested to give a holistic and honest view of the organization. The authors believe that these proposed measurement variables will help this organization and similar ones in understanding what processes are needed in order to create an environment where innovation is catalyzed.

Keywords: Innovation, Collaboration, Big Pharma, BioVentureHub, SMEs, Performance measurement, Value Capture, Life Science, KPI, Open innovation.

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Amanda Lindenmeyer Asadi & Malin Stenbom, Gothenburg, May 2020

Abbreviations

AI - Artificial intelligence
AZ - AstraZeneca
BRG - Business Region Gothenburg
BVH - BioVentureHub
CRO - Contract Research Organization
IP - Intellectual Property
NPD - New product development
PPP - Public-Private Partnership
SME - Small and Medium-sized Enterprise
VGR - Västra Götalandsregionen

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1

Introduction

In this chapter, the background, the aim with the study, delimitations and the specification of the issue under investigation including research questions will be presented.

1.1 Background

Global health is an increasing challenge. Between the years 2000 and 2015, the global average life expectancy increased by 5 years at the same time as the population has been and is still growing at a high rate (World Health Organization (2017)). In 2019, WHO listed 10 threats to global health, whereas one of them is noncommunicable diseases (World Health Organization (2019)). Noncommunicable diseases such as cancer, diabetes, and heart disease are responsible for 70% of all deaths worldwide, resulting in around 16 million people dying prematurely, and around 82 % of those occur in low and middle-income countries (World Health Organization (2018)). Global health challenges force society to constantly adapt. Therefore, the society and the life science industry is facing several challenges in order to be prepared for the future and to stay relevant within the industry. Life science companies such as Pharma- and Medtech companies need to find new ways to create value for patients, employees, and partners within the ecosystem (Reh (2020)). One of the challenges the society is facing is that we are entering a digitized society. Therefore, society needs to integrate, data, artificial intelligence (AI), and machine learning in order to create value in new ways (Reh (2020)). By integrating personal data in the life science industry, one emerging trend has been spending more effort in preventive care (Deloitte (2015)). Preventive care will lead to a much larger focus on preventing the outbreak of the disease than being reactive and treating an already sick patient. How patients are being treated is also moving towards a new era. One of the future trends seen is a shift toward precision medicine. This means that drugs and therapies are to a larger extent personalized to a person's biology instead of being designed for a global patient population, and sold as a blockbuster to the same extent as earlier (Deloitte (2015)). Moving into a society that is demanding new ways of treating people at the same time as the cost for treatments is increasing, requires new ways of ensuring that the treatments are affordable to everyone. To develop drugs and products that are combined between industry sectors requires cross-collaboration ((Jørgensen (2008), Deloitte (2015)).

To stay competitive within the life science industry, Sweden launched a new life science strategy at the end of 2019 (Regeringskansliet (2019)). The aim of the strategy is to give a holistic view of what Sweden as a nation should focus on to keep developing within the area and to make sure to remain relevant. The strategy has presented 8 focus areas;

1. Structure for collaboration
2. Utilization of healthcare data within research and innovation
3. Safe and ethical development of policies
4. Integration of research and innovation within healthcare
5. Welfare technology for increased independence, participation and health
6. Research and infrastructure
7. Competence, attraction of talents and a lifelong learning
8. International attraction and development of competence

Within these areas, several goals have been set up to reach the strategy. As a complement, every region has an action plan working more thoroughly with fulfilling the goals of the strategy. The existing action plan in Västra Götalandsregionen (VGR) has come to an end, and in 2020 a new will be launched. The new action plan will be in line with the focus areas of the national life science strategy.

To make sure VGR will stay competitive and in line with the global challenges, one investigation of what challenges and opportunities VGR has in terms of life science was conducted by Ingvar Carlsson and Bo Norrman in 2010 (Carlsson & Norrman (2011)). This was carried out when AstraZeneca shut down their two out of three research facilities in Sweden and moved parts of the existing research to Mölndal. Their research was now centralized around one facility instead of three. The investigation showed that VGR has several strengths including close collaboration between academia, healthcare, and the industry. The clinical research that is carried out in VGR is also highly developed. However, there were some areas in need of further development in order to fulfill the requirements in terms of regional and global challenges. The result of the investigation was a list of proposals of what the region needed to improve to work further with the global challenges. The proposals given were;

1. Development of clinical research and a continuous investment in Gothia Forum and quality registers
2. Development of competence
3. Create a group that is coordinated in terms of building consortiums when applying for funding
4. Increase collaboration between academia and the industry

The investigation carried out by Ingvar Carlsson and Bo Norrman, the regional action plans, and the life science strategy are all a part of making sure Sweden is improving global health.

Big Pharma companies are also facing several challenges in the changing society. By offering precision medicine to a much larger extent, the Big Pharma companies will not be able to develop blockbusters in the same way as before (Jørgensen (2008)), which will demand new business models to develop drugs in an affordable way for the company. Besides precision medicine, the Big Pharma companies have faced several challenges during the last years. Patents are expiring and there are difficulties in terms of risk-taking in the regulatory field. There is also a lack of innovation coming from highly invested R&D money (Gautam & Pan (2016)). The total amount worldwide R&D costs made by biotechnology and pharmaceutical companies have increased from USD 108 billion in 2006 to USD 141 billion in 2015 (Schuhmacher et al. (2016)). Even if R&D costs and the demand for new drugs and therapies are constantly increasing with the growing population, the Big Pharma companies struggle to invent and get NMEs approved in the pace that the society is demanding.

SMEs are also facing several challenges in the changing society. However, they are more innovative by nature and contribute with techniques and mindsets to the life science industry (European Commission (2018)). According to the European Commission, SMEs and entrepreneurship are considered as key elements in order to ensure innovation, economic growth, and new jobs in Europe (European Commission (2018)). Even if SMEs are innovative, they still face some challenges when developing new drugs and products. The biggest challenges SMEs have are finding financing, competence, and laboratories (Eriksson & Hannerz (2019)). This is crucial when companies are trying to survive until turning red numbers into black, also called the valley of death (Fernando (2019)). Large companies, however, have the possibility to scale, but they are limited when it comes to developing new ideas and business models (European Commission (2018)). They also have knowledge within several areas that are crucial when developing a drug or a device that many SMEs do not have. Two examples of knowledge that they possess are; how to manage clinical trials and what consider about when applying for a CE-marking (Clical Trials Arena (2012)).

To handle those challenges, Big Pharma companies have started to change their business models from a closed model where innovation is only taking place inside its own companies to an open model where different types of collaboration between Big Pharma, small biotech companies and academia is taking place (Gautam & Pan (2016)). The collaboration trend makes it possible for these actors to share both risks and rewards. This type of innovation model includes open innovation platforms, public-private partnerships, innovation clusters, and hubs (Sandström (2012)).

One initiative that a Big Pharma company has created is AstraZeneca's BioVentureHub (BVH). In January 2014, BVH was created to catalyze innovation between a big pharma company, academic groups, and several SMEs (Björnsne (2019)). To fulfill the goals of the nation and region within life science, public actors, such as Vinnova and VGR has invested from the start in the initiative. Since BVH has existed for a couple of years, the interest in how the life science ecosystem is being influenced by the catalyzation of innovation is high.

Understanding if BVH and its life science companies are increasing the output of innovation in the society is important for several stakeholders, including; investors, AstraZeneca, and the companies situated in the BVH.

1.2 Aim

The Master's thesis aims to understand how the outputs of catalyzation of innovation can be measured in a context like the BioVentureHub and to develop key performance indicators based on the result. By fulfilling the aim, this will further add to the understanding of what is needed to innovate the Pharma industry and contribute with a positive impact on global health.

1.3 Delimitations

The authors have made some delimitations to the research. The study is limited to the primary stakeholders, hereinafter referred to as the key stakeholders, connected to the BioVentureHub that are in direct contact and affected by the performance of the hub. The stakeholders within the scope of the study are the companies within BVH, AstraZeneca, and the investors. What intent and value that has been added to the secondary stakeholders within the life science ecosystem such as; universities, incubators, accelerators, and other life science companies will be excluded. The effect of BVH on the life science ecosystem will be based on interviews with the key stakeholders. Furthermore, a delimitation is that the interviews will only be held with a selected group of companies, interviewees at AstraZeneca will mainly be a part of the management team and excludes the perception of the common AstraZeneca employee, and lastly, interviews will be held with all investors except one.

1.4 Specification of issue under investigation

To fulfill the aim of the Master's Thesis, one main research question (MRQ) has been formulated.

MRQ: Which measurement variables are effective to use when measuring value capture in a context like the BioVentureHub?

In order to answer the main research question, suitable KPIs and metrics for the context need to be designed. For this purpose, the question has been divided into three research questions(RQ).

RQ1: What are the applicable models for the measurement of innovation- and collaborative network performance in a context like the BioVentureHub?

The already existing methods for measuring innovation, and within a collaborative network will be reviewed.

RQ2: What is the intent of the BioVentureHub from each stakeholder's perspective?

Second, the intent of the BioVentureHub from each stakeholder's perspective will be investigated.

RQ3: What value is added to each stakeholder related to the BioVentureHub?

Lastly, the value that the BVH has added to each stakeholder will be explored.

The result from each research question will be analyzed and combined in order to find effective measurement variables for a context like the BVH.

2

AstraZeneca's BioVentureHub

In this chapter, the context of the case, the BioVentureHub, will be presented.

AstraZeneca's BioVentureHub is a life science innovation hub situated in the heart of AstraZeneca's site in Gothenburg. The overall goal with the BVH is to catalyze innovation within the life science ecosystem and this is fulfilled through four sub-goals;

1. Creating an environment that facilitates the translation of research findings and discoveries into innovations, products, and companies within life science
2. Creating new ways for catalyzation of innovation through sector convergent collaborations
3. Providing a well-functioning life science ecosystem for sustained growth and job creation
4. Promoting internationalization and a collaborative culture

Currently, there are 28 companies and one academic group situated in the hub. The companies situated in the hub are divided into four different areas depending on their field of expertise; Drug, Device, Diagnostics, and Digital Health - 4D. In addition to the 4D companies, there are also a number of service companies situated in the hub. The thinking behind the hub is to create a dare to share a collaborative environment between a Big Pharma and SMEs. The Big Pharma company is in need of entrepreneurial knowledge and culture to be more innovative, and SMEs need competence and laboratories in order to survive the valley of death. However, AstraZeneca has no intent on investing in the companies situated in the hub. The innovation model is about sharing knowledge and infrastructure to be more innovative and help the life science ecosystem in bridging the gap between large and small companies. To ensure a dare to share culture, there is a requirement when applying that all the companies and academic groups that are situated in the hub already have their Intellectual Property (IP) settled. And therefore, BVH is not accepting startups since they are in an early ideation phase, and only SMEs that have reached a certain maturity level will be accepted. The idea of knowledge sharing is to create formal and informal ways of meeting each other by being co-located. The team behind BVH is arranging annual events and meetings to make sure that the companies and employees at AstraZeneca will meet each other. By having equal open access to the site as every employee at AstraZeneca, the companies in the hub have the possibility to access facilities and meet people in informal ways. Furthermore, to promote a sharing culture the BVH explicitly only admit non-competing companies towards both AstraZeneca and the already existing companies in the hub. BVH connects other large companies, hereinafter referred to as Big Industry, besides AstraZeneca to the SMEs in

the hub in order to expand the competence offering and include more actors in the collaboration model.

To make sure that the companies would benefit from sitting in BVH and at the same time make sure that AstraZeneca would not lose money by creating a collaborative experiment, several external investors have been a part of investing in the environment from the beginning. From the start until now, (VGR), Business Region Gothenburg(BRG), Vinnova and Carl Bennet AB have been the external investing stakeholders. When moving into the second investment round in 2020, VGR, Vinnova, and Investor AB are the main stakeholders investing in the next 5 year period. A simplified overview of the operation principles is displayed in Figure 2.1.

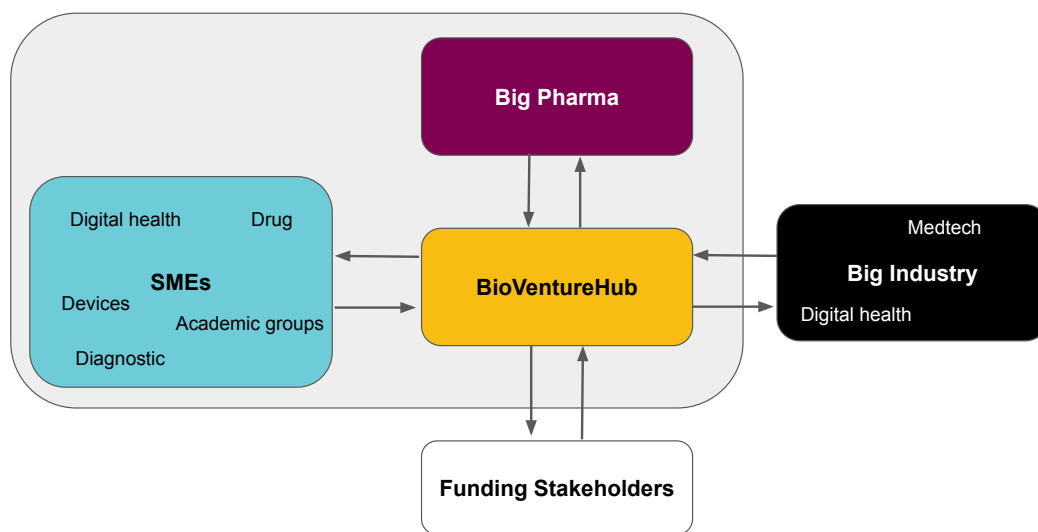


Figure 2.1: Simplified operation overview of the BioVentureHub

Research on this context has previously been conducted. One previous Master's thesis studied the value created for the companies situated in the hub (Dall & Johansson (2017)). Another in-depth study performed by a research group at the University of Gothenburg described how an open innovation initiative can be established in a large pharmaceutical company, including the institutional set-up of the hub, the governance structure behind, and how the structure can be implemented in the Big Pharma company. In previous research the initiative is defined as an open innovation initiative that falls within the contractual scope of a Public-Private Partnership (PPP) (Remneland-Wikhamn & Wikhamn (2014), Remneland Wikhamn & Styhre (2017), Remneland Wikhamn & Styhre (2019a), Remneland Wikhamn & Styhre (2019b), Remneland Wikhamn & Styhre (2019c)). So far the research has been focused on the value that has been created by having BVH. However, yet to be studied is the value that is being captured by its stakeholders, in other words, the output generated from an innovation initiative like the BioVentureHub.

3

Theory

In this chapter, theories around innovation in a knowledge society and theories around performance measurement will be presented. The section will start by describing the development of the knowledge society followed by defining innovation and describing theories such as open innovation and the triple helix innovation model. The performance measurement section will describe three commonly used frameworks, two having a strategy view, and one having a stakeholder view. At the end of the section, the theories will be connected.

3.1 Innovation in a Knowledge Society

In a context focused on bringing innovations to the market, a key aspect lies in the firm's ability to manage knowledge. In the post-capitalist society described by Drucker (Drucker (1993)), knowledge is the primary resource for individuals and the overall economy. In the post-capitalist society, the main worker becomes the knowledge workers with specialized knowledge. In modern society, the firm needs to learn two things; how to exploit its knowledge and how to innovate.

The theory of the firm transformed with this new society into focusing on the resources and capabilities of the firm to sustain a competitive advantage instead of the products of the firm (Wernerfelt (1984), Barney (1991)). With the shifted focus the intangible assets became the source for the competitive advantage of the firm rather than the earlier focus on tangible assets.

3.1.1 Knowledge

The main resource of a knowledge-based business is knowledge, and the primary role of the firm is integrating specialist knowledge of individuals into products and services. In order to create value, the firm became dependent on the following characteristics for utilization of knowledge within the firm; transferability of resources and capabilities between and in the firm, capacity for aggregation dependent upon the absorptive capacity of the firm, appropriability, specialization and production as the transformation of inputs in the form of knowledge to outputs. (Grant (1996))

In this specialized society, complementary assets and the ability to capture the value from such assets became important. When an industry radically disrupts and a creative disruption happens, new entrants succeed and incumbent firms fail (). In order for the incumbent firm to succeed, it must integrate with complementary actors in the ecosystem. (Teece (1986)) describes that the one that benefits the most from innovation is the fully integrated incumbent. Furthermore, he describes that the one profiting the most from innovation is not necessarily the innovator. Instead, the actor with ownership of the complementary

assets necessary for the commercialization path of an innovation is the winner. So for the incumbent firm not to fail when a market disrupts, it must integrate with the ecosystem while the small actors need access to complementary assets for successful commercialization of innovations. The benefits of strategic alliances like this between large pharmaceutical companies and small biotech entrants, together with corporate entrepreneurship of the incumbent firm has been shown by (Rothaermel (2001)). When the pharmaceutical value chain is affected by digitalization and transforms into a service-based rather than product-focused business, the firm's competitive advantage lies in its network-level strategy for the benefit of both the incumbent and the small entrants. (Rothaermel (2001))

As a conclusive, this is leading up to three suggestions to consider when creating suitable KPIs for effective exploitation of knowledge. First, how both the flow of tangible and intangible assets can be measured. Second, the specialization degree and existence of complementary assets in the network. Lastly, the collaboration between the big actor and the small ones.

3.1.2 Innovation

The term "innovation" has several meanings and it is widely used when creating a new idea or product. There are multiple definitions of what innovation is, and according to Americas' Council of Competitiveness (Porter & Stern (1999)) innovation is "The development and commercialization of new or improved products, processes or services.". The more recent definition includes value to a larger extent. Kastelle (2010), argues that innovation is "not just having an idea—but executing it so that it creates value." He means that by innovating you do not only have to create something new, but there is an importance in making sure to execute it and make sure the idea is creating value too. Chesbrough (2007) however, argues that innovation is not just about R&D and technology anymore. He argues that there was a time where companies invested a huge amount in internal R&D, but the cost of creating and developing new products has increased and therefore, technologies are not as profitable before losing value as they used to be. The innovation of today must therefore include novel business models instead of just R&D and technology. To be able to innovate a business model, there must be an understanding of the existing business model and the different paths that could be improved. According to Chesbrough (2007), a business model has two vital functions in order to sustain competitive advantage; creating and capturing value.

When a firm's competitive advantage is dependent upon its capabilities and ability to exploit its knowledge and innovate, there is a need to understand the innovation capabilities. Several definitions of innovation capability exist. In this study, the definition by Lawson & Samson (2001) defines innovation capability as "the ability to continuously transform knowledge and ideas into new products, processes, and systems for the benefit of the firm and its stakeholders" forms the basis. In recent days, innovation capabilities are more dependent on external perspectives, which the definition by Assink (2006) is including. The definition is written as, "Disruptive innovation capability is a driving energy to generate and explore radical new ideas and concepts, to develop them into marketable and effective innovations, leveraging internal and external resources and competencies". The second definition includes the thinking behind dynamic capabilities defined by Teece et al. (1997) as a "firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments". Importantly, these definitions together include the capabilities necessary for the commercialization of innovations,

producing value for stakeholders, leveraging external resources and competencies, and managing changing environments.

Based on the definition, capabilities of the firm are needed for the value creation of firm assets but also to capture value from external actors. Two value perspectives exist in literature named value-in-use and value-in exchange. First, the value-in-use perspective that views value as an outcome from processes when consuming resources. The outcome can for instance be a new product or service. By this definition, value is created when resources are used. For innovation, value is created through the processes of inventing, developing, producing, and delivering new market offerings. The second perspective looks at value creation as a process of exchanging resources between actors. From this perspective, the value is created when resources are exchanged rather than used. Value capture is defined as the process of securing financial or non-financial returns from value creation. From the perspective of Teece, it is a process for securing a part of the value when the innovation is put on the market. Therefore, the definition of value capture can expand to include partaking in another actor's value creation. (Chesbrough et al. (2018)) In terms of value creation and capture, the value perspectives value-in-use and value-in-exchange are applied, see Figure 3.1.

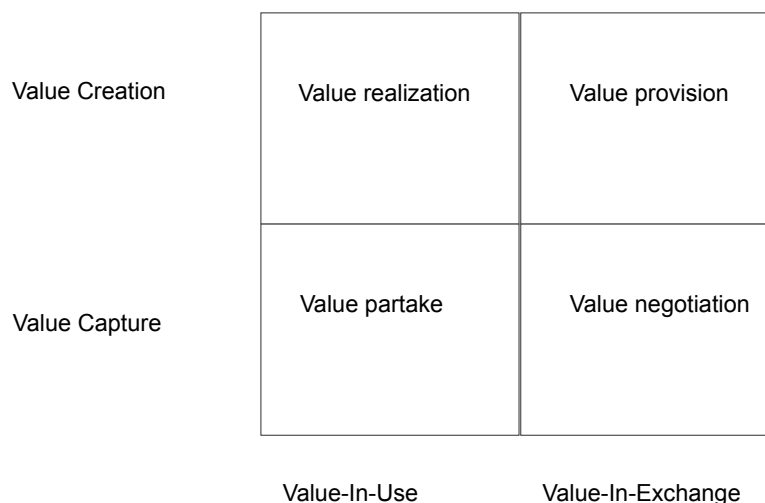


Figure 3.1: Division of value creation and value capture.
Source: Chesbrough et al. (2018)

3.1.3 Innovation models

Porter M E (1998) says that a growing trend for increasing innovation is with the help of being located at the same place to reach competitive success. By being located in a cluster, Porter argues that it represents a new way of thinking and it is challenging the way of working with companies, universities, and the government. He also argues that being located in the same cluster affects the competition in three ways; it increases the productivity of companies based in the area, drives the direction and pace of innovation,

and stimulates the formation of new businesses.

Except being located at the same place, there is a growing trend in increasing innovation through collaborations between different stakeholders, and two common ways of collaborating are through open innovation and by using the triple helix innovation model thinking.

3.1.3.1 Open Innovation

There are several definitions of open innovation and two of them are presented below. Chesbrough & West (2006) defines open innovation as “the inflows and outflows of knowledge to create internal innovation”. Most often this means sharing and exchanging knowledge and intellectual property between organizations. By adopting an open innovation thinking, the organization will make sure the boundaries of the company will be more transparent and this will enable the firm to use internal knowledge and resources in combination with external actors and their resources. Chesbrough (2003), defines innovation as either closed or open, see Figure 3.2. By closed innovation, he means that companies only innovate with their own internal resources and most likely they will commercialize their most promising ideas. When open innovation is added to an innovation process, there is a possibility to move on with ideas that would not have been realized in a closed innovation model when only having a firm’s internal resources as. Projects that in a closed innovation environment would get stopped, have the possibility to be out-licensed or utilized by for instance creating a spin-off in an open innovation model. This enables organizations to use and share resources and knowledge between when creating new, promising technologies. According to Chesbrough (2003), open innovation will reduce the time and cost of innovation projects by increasing the amount of solutions and innovations into patents, products, and technologies by having more time, resources, and knowledge.

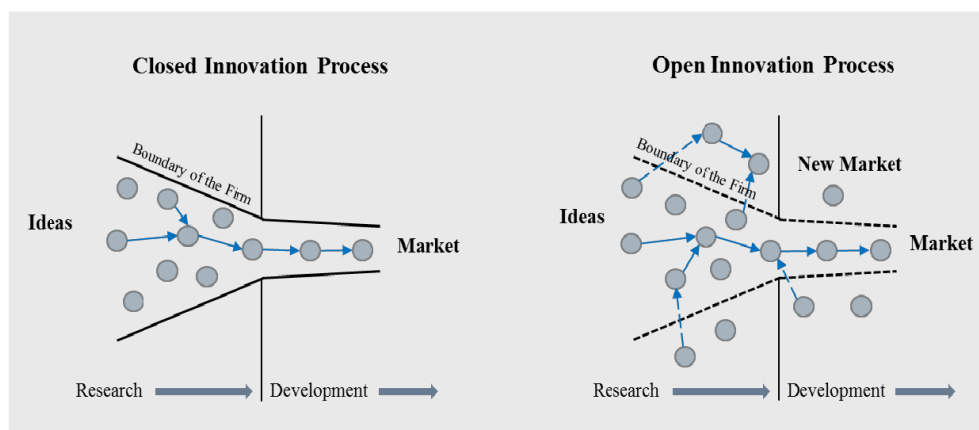


Figure 3.2: Chesbrough's definition of Closed and Open Innovation.
Source: Zogaj et al. (2012) adapted by Chesbrough (2003)

Chesbrough's definition of open innovation is mainly focusing on the transfer of assets and knowledge between actors, and it does not mention the driving force to share R&D with an external actor to share the risk of the development of the product. This is crucial since almost every company is facing those risks in the development phase.

This aspect of open innovation is taken into consideration by Simoes-Brown. Simoes-Brown (2011) defines open innovation as: “innovating in partnership with those outside a company by sharing the risks of the process and rewards of the outcome”. Even if knowledge sharing is a core value of open innovation, there is an advantage of also sharing both risks and rewards. Driving innovation within an organization is expensive and the success rate is not as high as desired. So, by sharing these kinds of risks, a loss might not feel as tough as it would have felt if a company was trying to innovate on their own.

One example of how to contractually manage knowledge and risk-sharing systems within an open innovation model is through a public-private partnership (PPP). A PPP is usually a long time arrangement between two or more public and private actors to build a public asset or a service. (Deloitte (2018)) By bringing these actors and their specific knowledge together, there is a hope to finance, build, and operate large projects. By financing a project through a collaboration between public and private partners, it increases the likelihood to complete a project sooner, and sometimes even making it possible from the beginning. A PPP is a way to construct an open innovation collaboration between public and private partners. A model where collaborations between the university, the industry, and the government to increase innovation was first introduced through the Triple Helix Model of Innovation by Etzkowitz & Leydesdorff (1995).

3.1.3.2 The Triple Helix Innovation Model

The Triple Helix Model of Innovation is focusing on interactions between the three different actors to promote economic and societal growth in a knowledge society. The model is divided into three circles, where each actor is representing one, and by putting them together there will be interactions between them, see Figure 3.3. (Etzkowitz & Leydesdorff (2000) Etzkowitz (2007))

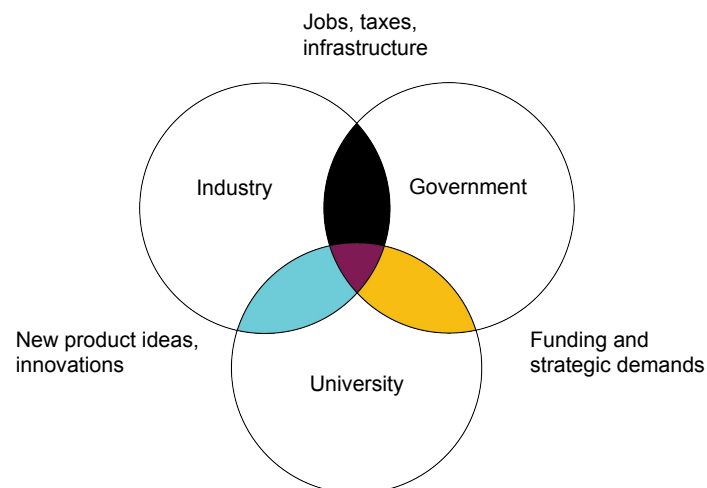


Figure 3.3: The Triple Helix Innovation Model
Source: Modified from Etzkowitz (2007)

The interactions are built between;

- **University - Industry;** The role of the universities is to provide education and basic research, and the main interactions between university and the industry were

initially made through this. The thinking behind the interactions of basic research is that the university is supposed to provide research, and the industry is commercializing the research. To make sure education is provided, the amount of interactions between people working in the industry and at the universities are vital. Etzkowitz (2007) argues that the knowledge that is transferred between the industry and university is an important piece when it comes to knowledge transfer.

- **University - Government;** According to Etzkowitz & Leydesdorff (2000), the interactions between university and the government highly depends on what relationship the government has to the policies that exist, and towards higher education. Their model uses a spectrum that shows the difference in if higher education is public or private. When it is public, the government would to a larger extent have the possibility to influence the research. It is also more common to fund a research project when it is public compared to if the higher education would be private.
- **Government - Industry;** The interactions between the industry and the government depends on the attitude the government has towards the market. The Etzkowitz (2007) model proposes a spectrum when it comes to how much the government is influencing the market. A market where the government does not have the possibility to influence to a large extent is mainly about preventing market failures. If the government can influence to a larger extent, the interactions can for instance involve the regulations of the industry.

The triple helix model has been further developed, including more dimensions to the different interactions that exist. There have also been further extensions of the model into a Quadruple and Quintuple Helix Model where a fourth and a fifth dimension has been added to the helix. The fourth dimension that has been added is the civil society including creativity, culture, and media. Lastly, the fifth dimension that has been added is the natural environment, including socio-ecological interactions. (Carayannis & Campbell (2012), Carayannis et al. (2012))

3.1.3.3 Connecting the theories to the context

In the BioVentureHub context, one value proposition towards SMEs is access to competence from a Big Pharma company while the Big Pharma at the same time integrates better in the ecosystem, connecting to the theory of complementary assets described by Teece. In the context, Grant's characteristics for utilization of knowledge will be applied to understand what aspects that should be considered when measuring competence exchange. The focus of the study will be on measuring the intangible assets of the context for competitive advantage even if the tangible assets will be included as well.

One goal of BVH is to help companies create innovations and give them a new way of thinking. BVH is not only focusing on what or how many innovations that are created, but also the value of a new product, service, or model is creating in their business model. Therefore, the definition by Tim Kastelle explains their thinking of innovation. The business model of the BVH could be described as helping both AstraZeneca and the companies to innovate more by improving their business models, and therefore, Chesbrough's thoughts about business model innovation are good add-ons to Kastelle's definition of what innovation is.

Chesbrough et al. (2018) mentions the importance of creating and capturing value. Within the context of the study, the core interest is in understanding what value that has been captured from constantly creating value through processes. This is placing BVH in the value partaking box, according to Chesbrough's visualization, see Figure 3.1. In this context, value creation is analog to the inputs of the initiative, and the outputs of the initiative are analog to the value that has been captured. To understand what value that has been captured, there must be an understanding of which innovation capabilities are important in the BVH context.

BVH has in previous literature been defined as an open innovation initiative and in this study, the open innovation theories will continue to be applied to the context when developing KPIs. Innovation models involving public and private partners, such as PPP and the triple helix innovation model are highly relevant in the BVH context. The thinking behind BVH is to create an environment where public and private partners can collaborate and interact with each other, and the outcome will for instance be new products, ideas, jobs, and infrastructure, which is the thinking behind the triple helix model. However, the university is not a key stakeholder in the BVH concept as it is in the model, but some interactions do exist.

3.2 Performance Measurement

With the move from an industrial economy to a knowledge-based one, there came a need for measuring the intangible assets of an organization due to the value shift from the tangible assets. In the society described by Drucker (1993), the competitiveness of a firm is dependent on capabilities rather than the speed of the worker. (Kaplan & Norton (1992)) In the 1950s the movement for new measurement methods began with researchers identifying a problem on how a sole focus on financial estimates negatively affected the competitiveness of the firm. Leading up to the big shift from measuring financial measures towards a larger focus of intangible assets in the 90s where several of the most established methods nowadays were developed. However, the hype in research on performance measurement involved scholars from different disciplinary backgrounds developing frameworks from different perspectives, including a strategy and a stakeholder perspective (Folan & Browne (2005), Folan et al. (2007)). The scholars are using different approaches when developing frameworks but they are based on the common challenge of ensuring that performance measurement systems relates to the organization's strategy (Neely (2005)). Besides measuring that the operations of a firm are aligned with the strategy and to what extent, other values have been highlighted in the literature. For example, it is needed to make sure the organization reaches its goals, for the evaluation of long-term success, in order to benchmark towards competitors, to show success of implementation of new initiatives and processes, and as an external presentation towards stakeholders (Kaplan & Norton (1992), Neely et al. (2001), Sveiby (1997)).

In 2005 the research field was still deemed immature with a lack of consensus between scholars with 99% of all articles cited less than 5 times. The two most prominent theories within performance measurement are both from the first half of the '90s, one in the field of accounting and the second in manufacturing and operation management. Neely (2005) describes how these theories are developing in a cyclic manner, see Figure 3.4. Starting with problem identification as in the '50s followed by new proposed frameworks in the '80s-'90s and lastly methods of application in the '90s as well. Since then, these theories

have been investigated, verified and new problems have been identified. A few will be highlighted in this study, some that already have new investigated frameworks, and some were an addition need to be proposed. (Neely (2005))

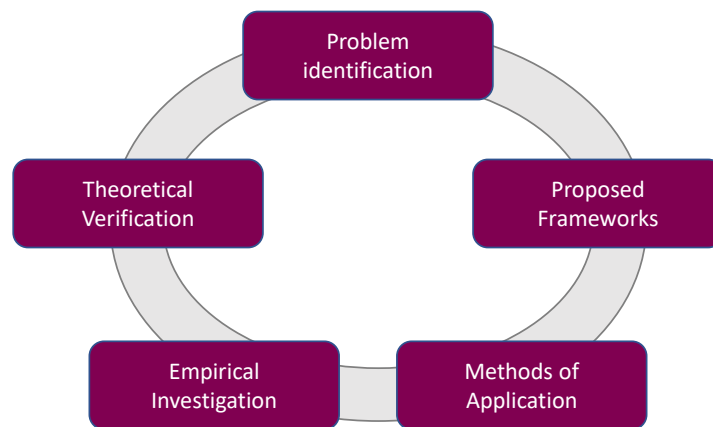


Figure 3.4: Visualization of theory development in the Performance measurement field.
Source: Neely (2005)

The dominant theory in the field is the Balanced scorecard developed by Kaplan & Norton (1992) and research suggests that between 30-60% of firms have adopted the theory. (Neely (2005)), with Performance prism is another well-cited and established framework in the field of performance measurement. Both these theoretical frameworks represent two core divisions of research in the field; the balanced scorecard starting with the strategy of the firm representing the strategy view and performance prism starting with the stakeholders' representing the stakeholder theory. The feature of a third theory developed in the second half of the '90s, the intangible asset monitor by Sveiby (1997), is included as well since it has a strategic view and a more central focus on human competences.

The frameworks that are about to be described are performance measurement frameworks. Performance measurement is not to be confused with performance management. Performance measurement describes what should be measured while performance management describes what to be managed. Improving the alignment between these two fields is needed to make sure that when developing performance measurement systems, they can be properly used for strategically managing an organization (Folan & Browne (2005)).

3.2.1 Strategy View

In the following section, two theories using the strategy view will be described.

3.2.1.1 Balanced Scorecard

Like many other frameworks, The Balanced Scorecard by Kaplan & Norton (1992) was developed during the 1990s. As mentioned earlier, it is the most commonly used performance measurement framework, where around 30-60 percent of all firms have adopted the scorecard to their organizations. The framework is a way to translate the vision and the strategy of the company into four different categories of measurements; financial, customer, internal business process, and a learning & growth perspective, see Figure 3.5. The categories are further described below;

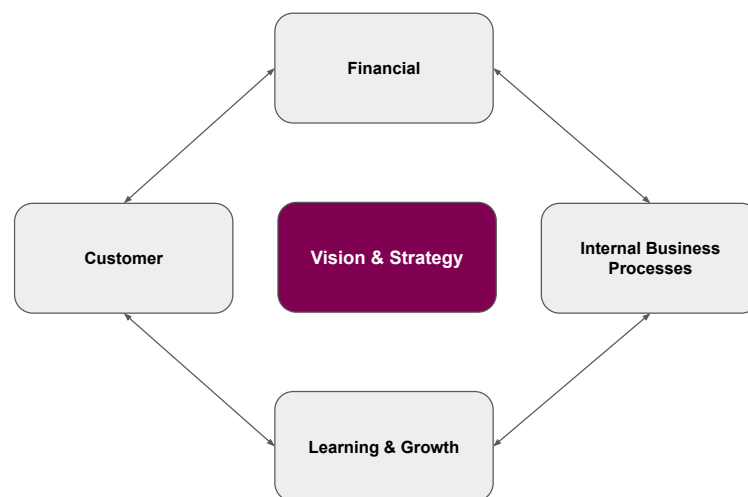


Figure 3.5: Modified version of the adapted Balanced Scorecard by Kaplan & Norton (1996b)

- **Financial**; In many of the frameworks that exist, there is a focus on intangible assets and non-financial measurements. In the Balanced Scorecard, Kaplan and Norton have decided to keep financial measurements, since financial data will always be important for managers at a firm, and their hope has been to give a balanced view including both financial and non-financial measures. The financial measures are a way to constantly think about how an organization or a firm looks in its shareholder's eyes. Examples of measures are sales growth and cash flow.
- **Customer**; Customer satisfaction and focus are important for a business. A direct outcome, if a customer is unsatisfied, is to change their supplier to someone else that is meeting their requirements and needs. Customer satisfaction is triggered by the question "What is important to our customers and stakeholders?". Continuously measuring and asking how customers see a company is a good complement to the financial metrics. Examples of measures are on-time delivery and ranking by

important customers.

- **Internal Business Process;** Meeting customer requirements is important, but to manage to do so, a business and its managers need to keep track of how the internal business and its processes should meet those needs. Internal metrics should be based on what processes and work that needs to be done within the company to increase customer satisfaction. The question a firm should ask themselves is “What must we excel at?”. Except for creating measures where customer satisfaction is a core, a business should also introduce metrics for its critical technologies and core competencies. Examples of measures are quality and productivity.
- **Learning & Growth;** The measures behind the internal and customer perspectives are the core metrics behind the company. But to sustain competitive advantage, a company needs to constantly create and improve their already existing products and services. By constantly learning, improving, and innovating, a company will create new products and more customer value, and this will lead to market growth and value for the shareholders. The question that a company constantly needs to ask themselves is “How can we continue to improve, create value and innovate?”. Examples of measures are the time to market versus competitors and life cycle to product maturity.

For all categories, an organization needs to set up both goals and metrics, and those metrics are a way of measuring that the firm is reaching the goals they have set up.

The balanced scorecard that was developed in 1992 is a first-generation scorecard and there have been several attempts to further develop the first version and alternatives to the scorecard and its perspectives have also been suggested. Kaplan & Norton (1996a) themselves released an updated version with a focus on creating fewer measures and giving them a strategic focus and linkage including a strategy map. The adaptations made by the authors in 1996 also resulted in renaming the category “internal” to “internal business processes” and “innovation and learning” to “learning & growth”.

Since then, the theory has been further developed leading up to a third-generation balanced scorecard at the beginning of 2000. Adopted versions are being used and have additions such as alternative categories and destination statements in order to adapt the scorecard to our society and new business models (Lawrie & Cobbold (2004)).

3.2.1.2 Intangible Asset Monitor

In 1997, a model for measuring intangible assets, called The Intangible Assets Monitor was developed (Sveiby (1997)). The method is focusing on non-financial measures and the background for doing so is that Sveiby means that all assets that exist, both tangible and intangible ones are created by the help of human actions and they are dependent on the existence of the humankind. He means that these human actions create internal and external expressions and structures. For instance, when a company is focusing on and directing their efforts internally, new processes and structures are created inside of the company. If the company is focusing externally, the outcome can be new relationships and interactions besides the products that are created. These types of interactions and outcomes are often invisible and difficult to measure. According to Sveiby (1997), they can be divided into Employee Competence, Internal Structure, and External Structure.

- **Employee Competence** includes the possibility for employees to interact both internally and externally.
- **Internal structure** may include models, patents and different systems. These are often bought or created in-house by the employees and owned by the organization, which is creating confidence internally when developing or investing in such an asset. The internal structure also consists of the culture and spirit, which is created by interactions by the employees. The internal structure, the people, and their interactions are what generally is called the organization.
- **External structure** often includes relationships with customers and suppliers, brand, and reputation. In an external structure, the organization is much more dependent on relationships and the external environment, and this creates uncertainty instead of the same confidence that exists in the internal structure. An organization's reputation and brand are highly dependent on its relationships with customers and suppliers which can change over time.

Since performance measurements are made for external presentation and for monitoring the organization internally, measures need to be created to meet both of these requirements. And therefore, Sveiby (1997) proposes indicators including both growth/renewal, efficiency, and stability to meet internal and external expectations. This has been the basis when creating The Intangible Asset Monitor (IAM), see Table 3.1. The purpose of the IAM framework is to measure change and knowledge flows and to get an understanding of how intangible assets are developed and utilized in terms of growth/renewal, efficiency, and structure.

Table 3.1: The Intangible Asset Monitor model

Employee Competence	Internal Structure	External Competence
Indicators of growth/renewal	Indicators of growth/renewal	Indicators of growth/renewal
Indicators of efficiency	Indicators of efficiency	Indicators of efficiency
Indicators of structure	Indicators of structure	Indicators of structure

3.2.2 Stakeholder Theory

In the following section, one framework using the stakeholder theory will be described.

3.2.2.1 Performance Prism

The Performance Prism, developed by Neely et al. (2001), is a tool that can be used as guidance when designing what questions that need to be considered when an organization is creating performance measurements. This is a more recent method than the Balanced Scorecard and was developed when the society entered a new era with a knowledge-based economy. The Performance Prism is divided into five different sectors that need to be taken into consideration; Stakeholder Satisfaction, Strategies, Processes, Capabilities, and Stakeholder Contribution, see Figure 3.6 (Neely et al. (2001)).

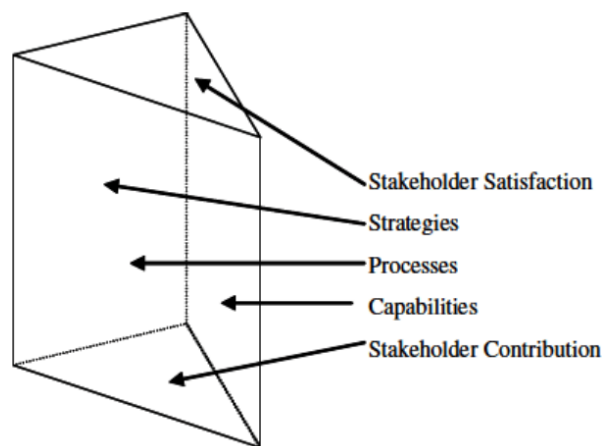


Figure 3.6: The Performance Prism
Source: Neely et al. (2001)

When creating key performance indicators, stakeholder satisfaction is the first sector that needs to be taken into consideration. Besides having shareholders and customers as stakeholders, the performance prism is also including employees as a stakeholder to have in mind. To make sure this section is fulfilled, there must be an understanding of who the important stakeholders are and what needs they have.

The second section is focusing on strategies. The starting point should therefore not be the company strategy, the only reason for focusing on the company strategy is to make sure that value is brought to the stakeholders. So once the company knows who are the important stakeholders, there is time to think about what strategies that are required in order to make sure the wants and needs of the stakeholders are fulfilled.

The third section of the performance prism model is understanding what processes are needed to make sure the strategy is being followed. These processes include generating demand, fulfill demand, develop new products and services, and manage the enterprises. Each process should have measures asking and making sure the demand is fulfilled.

The fourth section of the Performance Prism is Capabilities. Capabilities is a concept that is being used in the context of innovation and performance. According to Neely et al. (2001), capabilities are *"the combination of people, practices, technology, and infrastructure that together enable execution of the organization's business processes"*. Capabilities are the key to sustain competitive advantage towards others. To make sure the fourth section is being realized, a company needs to ask themselves what capabilities that are needed to make sure their processes will operate as they should.

The fifth and the last section is Stakeholder Contribution. This is added as a separate component since this section means that the organization does not only have to contribute and add value to its stakeholders, its stakeholders also need to contribute when entering into a partnership with the company. One example is the employees. The employee as a stakeholder wants a secure and fun employer offering a decent salary, but the employer expects that the employee will contribute to the organization in return. This is a critical and unique component when designing measurables.

3.2.3 Connecting the theories to the context

In the BioVentureHub context and this study specifically, the perspectives of stakeholders are in focus which makes the Performance Prism a suitable framework to use initially. The stakeholder theory is however criticized by Kaplan, arguing that a performance measurement system should start with the strategy rather than the stakeholders with the argument that an organization can not meet the expectations of all stakeholders (Kaplan (2010)). The dual perspective of balancing how stakeholder objectives fit into the strategy of the BVH is therefore important to keep in mind when applying the framework and therefore the theory ground from the Balanced Scorecard and The Intangible Asset Monitor will also be used. The Balanced Scorecard for balancing the mixture of financial and non-financial metrics and the Intangible Asset Monitor with the focus on knowledge from human resources.

4

Method

In this chapter, the method of the study is outlined. The chapter starts with describing the research strategy, followed by how it has been designed. Furthermore, the research process will be described in detail, including how the data has been analyzed. Lastly, one section describes how the quality of the research is fulfilled.

4.1 Research Strategy

In this section, the research strategy of the study will be designed based on the nature of the research described in the following subsection.

4.1.1 Key phenomena under study

In this study, AstraZeneca's BioVentureHub is examined in order to understand what would be suitable measurement variables in such an initiative. The foundation of the collaborative initiative is based on the theory of open innovation. Collaborations between large corporations and start-ups have previously been examined in the open innovation literature. However, since the BVH is a collaboration between Big Pharma and SMEs, explicitly excluding start-ups, the initiative fails to fit in a previously examined open innovation model. BVH is furthermore a public-private partnership (PPP) since public actors have invested in the initiative. But models describing a collaboration between public and private actors, such as the triple helix innovation model include university as a key stakeholder while in this context the analog interaction is between large and small industry actors instead. Performance measurement is a widely studied field with established models that would be suitable to use in a deductive manner for validation. The problem is that the specific context is not examined enough, and no current models found when reviewing the theory fits the BioVentureHub, to form a hypothesis. The alternative of an inductive research strategy was also considered but was deemed less effective. Instead of reinventing the wheel, sections from Performance Prism was used when performing the research as guided themes.

An established theory combined with observing a less defined context makes an abductive research strategy suitable. The development of suitable measurement variables will be the best prediction based on the specific set of parameters from bridging innovation with performance measurement theories applied to observations of stakeholders to BVH.

4.1.2 Epistemological and ontological foundation

The key phenomenas under study are innovation and performance; epistemologically subjective concepts rather than objective making a positivistic approach unsuitable. The

research is studying how individuals interpret the key phenomena in the BVH and therefore using an interpretivist approach of understanding rather than explaining.

The context under study is BVH. The hub itself is still quite novel, it will to a large extent become what the individuals connected to the hub perceive it to be, rather than being a constraining force on its members. The hub has core values, that members freely can apply to their organizations. Those core values are impacting the culture, but not to the extent of creating an objective reality where members are constrained but rather work under a general understanding where members are free to apply the culture as it fits. Due to the constant change, a constructionist position of the organization is the best fit for the study.

The main concepts under study are social constructions that are ontologically subjective. The concepts of innovation and performance are not an external objective reality but dependent on individuals' creation. However, if the concepts that are being valued and seen as necessary for greater innovation performance can be objectively measured, and if so, what metrics that can be used for measurement is the main research question to be investigated in this study.

4.1.3 Choice of method

When constructing a research strategy, one thing that needs to be taken into consideration is if the research will be based on quantitative or qualitative research. In this study, a qualitative approach will be used for the abductive study based on the ontological and epistemological considerations being an interpretivist constructivist view.

4.2 Research Design

The research was designed as a two-part study with a literature review and a case study. According to Bryman & Bell (2011), the definition of a case study entails "the detailed exploration of a specific case, which could be a community, organization, or person." In this case, the research was made on one organization, the BVH. The case study focused on understanding what value that has been captured in the hub by the closest stakeholders to the BVH and how those values can be measured.

4.3 Research Process

Theories for performance measurement include frameworks for the development of metrics and therefore the research process has been influenced by theories. For a collaborative network a framework has been developed similar to a design thinking methodology that was used when dividing the case study into four phases; background analysis, data collection, data analysis including a workshop for validation and KPI development (Saunila (2014)).

4.3.1 Background analysis

A background analysis was conducted to understand the context under investigation, the BioVentureHub. Both previous research on the subject and analyzing an already existing survey that the companies in the BioVentureHub have answered, gave a better understanding when entering the data collection phase.

4.3.1.1 Review of survey

For five years, BVH has sent out an annual survey to the companies that are situated in the hub. Before starting the data collection phase, a review of the latest survey has been made to get an initial understanding of how things are progressing for the companies and what seems to be more and less appreciated with BVH.

4.3.2 Data collection

Data was collected in order to answer the three sub-research questions of the study. RQ1 was answered through a literature review using articles. RQ2 and RQ3 were answered with data from interviews. For an overview see Table 4.1

Table 4.1: Data sources for each research question

	Research Question	Method	Data Source
RQ1	What are the applicable models for the measurement of innovation- and collaborative network performance in a context like the BioVentureHub?	Literature review	Articles
RQ2	What is the intent of the BioVentureHub from each stakeholder's perspective?	Case study	Semi-structured interviews
RQ3	What value is added to each stakeholder related to the BioVentureHub?	Case study	Semi-structured interviews

4.3.2.1 Literature review

A literature review using keywords and co-citations to find relevant articles was made to answer RQ1 and to build upon the already existing theories. The question was developed into three sub-questions; how traditional measurement frameworks suit the context, what models exist for measuring innovation in organizations, and what models exist for measuring innovation in collaborations.

4.3.2.2 Semi-structured interviews

Research questions two and three were answered using semi-structured interviews with relevant people in each stakeholder group, see Appendix 9.1 for an interviewee overview. This qualitative approach gave indications and concepts to understand what is valuable to the key stakeholders of the BVH.

The semi-structured interviews consisted of open questions within six topics that were under investigation, built upon existing theory, and the themes that were found in the background analysis, for complete interview templates see Appendix 9.2. The six topics were developed through bridging the performance prism framework with aspects from the innovation literature to capture both the stakeholders and the soft values in an innovation setting. An aim for each interview topic was developed, see Table 4.2, to keep the questions open yet to get coverage of needed areas from every interviewee. Before the interview, the interviewee was informed that the interview aimed to understand what they see as valuable with the BVH. They were also informed that the interviews would form as

the basis when creating KPIs for BVH.

Table 4.2: Interview topics and the corresponding aim to be answered during the interview.

Interview topic	Aim with the topic
Introduction	To give the interview subject an understanding of the purpose of the project and why KPIs are being developed to establish trust. Get an initial understanding of their role, organization and current situation.
Strategy for stakeholder	Understand needs, goal and processes that are needed to reach the goals and satisfy the needs. The input needed to reach wished outputs.
The purpose for being a stakeholder	Understand the reason for becoming a stakeholder and what the BVH can contribute with to the organisation.
What value has been created and captured	Understand the value for being a stakeholder and the value that has been captured by the stakeholder. Understand what is unique in the setting and do not exist somewhere else from their perspective.
Innovation capabilities	Understand specific inputs/processes/outputs necessary for innovation and collaboration. Understand how each stakeholder contributes to the environment.
BVH in the future	Understand what is a optimal BVH and what is needed in order for the stakeholder to think so.

The interviews were held with the closest stakeholders to the BioVentureHub, interviews were also conducted with the employees of the BioVentureHub. Every stakeholder got questions within the chosen topics, but the questions were formulated differently depending on what relation the organization or person has to the BioVentureHub.

4.3.2.3 Data Sample

As mentioned earlier, the data sample consists of the closest stakeholders to the BioVentureHub, including AstraZeneca, the companies situated in the hub, and the investors. From AstraZeneca, interviews with six people at management level were held, 10 interviews with companies that currently are or have been situated in the hub, and six interviews with investors. All investor groups were asked to participate, all participated except one that decided not to. The companies were sampled to get a good mix between different companies in different fields within life science, the amount of time spent in the hub, and the maturity level of the company. Three interviews were also held with employees of the BioVentureHub. The entire team of the BVH was invited to the workshop, and all participated. For a full list see Appendix 9.1.

4.3.3 Data analysis

Grounded theory was used as the framework for analyzing the qualitative data from the semi-structured interviews since it is a widely used framework and an iterative approach

suited the framework used when developing KPIs, seen in Figure 4.1.

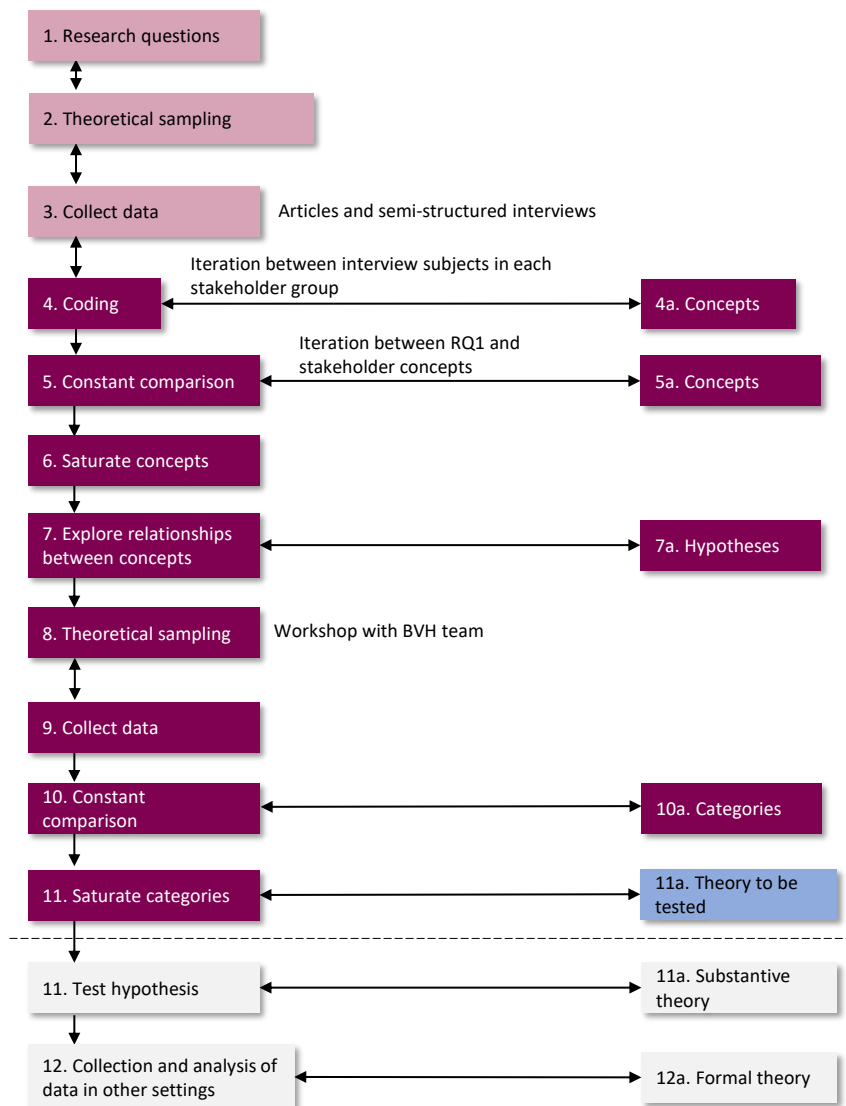


Figure 4.1: Overview of the research process highlighting the process for data analysis using grounded theory

The process followed an adapted version of the scheme from (Bryman & Bell (2011)) with the addition of point 11a which is the formed theory to be tested in practice.

The themes used for coding in step four were as the interview topics based on the theory of performance prism and separated into two research questions, see Table 4.3. When continuing step four, concepts were generated for each stakeholder through clustering the answers found in the themes for the intent and value added for the stakeholders and formed the basis of the result for RQ2 and RQ3.

Table 4.3: Connecting the research model with the theory framework Performance Prism and the interview topics

Our model	Performance Prism	Coded themes
RQ 2: Intent	Strategy	Goal with BVH
		Background
	Stakeholder contribution	Future
RQ 3: Value Added	Processes	Processes
	Capabilities	Innovation capabilities
		Value added
		Results
	Stakeholder satisfaction	Needs

In steps five to nine the concepts for each stakeholder were compared with the theory from RQ1 to form saturated concepts that were tested on the team of BVH during a workshop. To engage the stakeholders and make sure that the KPIs are created in a way that seems logical to the ones who are going to use them. This was also a way to try different performance indicators out and make sure that it falls within the current and future processes of the organization.

Using insights from the workshop in step ten, the categories that the KPIs were developed from could be saturated in step 11. The main research question could therefore be answered using theory from RQ1, data from interviews, and insights from the second theoretical sampling using a focus group.

4.3.4 KPI development

When forming our final theory to be tested consisting of suitable KPIs for a collaborative innovation initiative; appropriate input, process, and output metrics for each category were found using theory, results from interviews, and the workshop. In the next step, the categories were paired with the goals of the organization. The process was iterated until a suitable group of metrics could be found.

4.4 Quality of Data

To assure the quality of the research, the reliability and validity criterias were evaluated according to the framework proposed by Bryman & Bell (2011). Furthermore, since this study is qualitative, the alternative criterias, trustworthiness, and authenticity, from Lincoln (2007) and Guba & Lincoln (1994) were employed together with some methods to improve the quality. This, in order to front some of the challenges concerning validity that qualitative research inhibits.

4.4.1 Reliability

The criteria of external reliability is rather difficult when performing a case study since it captures the social setting under a limited time. It is difficult to assure to what degree the research can be replicated, instead it captures the hub at a certain point in time. However, since several individuals within a stakeholder group were interviewed to create an understanding of the whole group it is more likely to be replicated since the opinion of a

large group should differ less than the opinion of one individual.

The strategy for the internal reliability was to uphold inter-observer consistency through always conducting the interviews in pairs. The confirmation of findings and observations in each interview was confirmed and aligned directly after the interview. The transcription of interviews was divided between the researchers, and when writing the summary the transcriptions were interchanged so that every analysis would be analyzed by both researchers.

4.4.2 Validity

The internal validity is limited to the time of observation for ensuring a good match between findings and theoretical ideas. Since the time for this study is highly limited it lacks time for internal validation among all stakeholders.

External validity faces some challenges due to the uniqueness of the setting and that the study is set up as a case study with a limited set of interview samples.

4.4.3 Trustworthiness

To ensure the credibility of the study, in other words, the internal validity, there must be an alignment between what has been said and the findings from the interviews. To secure this, the method of respondent validation has been used. After each interview, an account of the findings used in the analysis from each interview was sent out for a confirmation to each research participant. Changes were made aligned with the feedback received.

To increase the transferability of the study, in other words, the external validity, thick descriptions are used to describe the process in depth. The conclusions are suited to the specific context but do not exclude the possibility that the model, or parts of it, will be applicable in other similar initiatives.

Dependability, in other words, reliability, is difficult in a study like this, and therefore records of all phases, notes, selection of research participants, interview transcripts, and data analysis were kept.

Complete objectivity is impossible but establishing confirmability has been one of the objectives for the researchers of this study. With the aim of being open-minded throughout the research phase to avoid personal values to affect the interviews.

4.4.4 Authenticity

Research participants were chosen in order to fairly represent the different viewpoints of each stakeholder group. Companies in the hub were chosen to represent a diversity including both new companies and those who have left. All investing stakeholders were asked to participate, all except one did.

5

Results

In this chapter, the sub research questions are answered. The section is divided into three, where the first one describes how existing performance measurement models can be applied to the context, second, what the intent of the stakeholders has been to be a part of the initiative, and lastly what value that has been added to the stakeholders that have been a part of the initiative.

5.1 Measuring Innovation Performance within a Collaborative Network

This section is answering RQ1. The question will be answered by understanding if traditional methods could be used when measuring the performance of BVH, followed by an analysis of what frameworks for measuring innovation and collaboration exist.

As an initial part of the research, to answer RQ1, the field of performance measurement was studied from an innovation measurement point of view. The results are presented in three parts; first if the traditional performance measurement systems can be used in a collaborative innovation initiative like the BioVentureHub. Second, the frameworks developed to manage innovation performance in a firm and third, the more recently developed frameworks for innovation from collaboration.

5.1.1 Understanding if traditional methods fit a collaborative innovation context

The traditional methods were established in the 90s when innovation was an in-house process within a company and the concept of open innovation was not introduced. Since then, new movements within innovation have been introduced leading up to new types of innovation initiatives such as BVH. When considering whether or not the traditional frameworks suit the BVH, aspects such as open innovation, triple helix innovation models, SMEs, and non-profit organizations need to be taken into account.

5.1.1.1 Balanced Scorecard

One of the most common frameworks for performance measurement is the Balanced Scorecard by Kaplan & Norton (1992). As mentioned earlier, the method is divided into four areas, taking financial analysis, customer satisfaction, internal business processes, and learning & growth into consideration. Criticism for the use of the balanced scorecard for innovation settings can be divided into two. First, the framework was designed before innovation and collaboration was a growing trend in society (Al-Ashaab et al. (2011)). The Balanced scorecard was also developed before the definition of open innovation was introduced by Chesbrough in 2003. Second, a drawback that has been directed towards

the framework is in its basis in accounting systems. The scorecard ignores the financial value in intangible assets such as research in progress, HR, and the goodwill that the company has built. Furthermore, it is criticized for having too much of a backward focus rather than forward-thinking which might lead to situations focused on numbers and short-term financial results (Nørreklit (2000), Eccles (1991), which are two key aspects when assessing the value of innovation.

Since the framework does not take innovation or stakeholder needs into account, which is important in the context of BVH, the method is not optimal as a stand-alone. The Balanced Scorecard has mainly been tested in large corporations, and there is limited literature on the use of it in SMEs, however, research has been conducted showing that many strategic issues look the same in both small and large firms (Andersen et al. (2003)). According to Andersen et al. (2003), the adjustments from 1992 to 1996 resulted in a more strategic view, and these types of adjustments have increased the relevancy when measuring performance in SMEs.

Kaplan has since the publishing of the Balanced Scorecard extended it to also be suitable for nonprofits and public organizations, suggesting that the financial objective can be changed into the organization's social impact or mission instead (Kaplan (2010)). Even so, there is still criticism that the balanced scorecard is not relevant for all stakeholders, including the public sector, non-profit organizations, and complex organizations which have resulted in new types of scorecards being developed (Al-Ashaab et al. (2011), Moullin (2017)). The balanced scorecard has also been adopted to be used for managing corporate alliances with an example of an alliance between two pharmaceutical firms. The scorecard is specifically for joint ventures but is a step forward towards a scorecard for collaboration. (Kaplan et al. (2010))

5.1.1.2 Intangible Asset Monitor

The method proposed by Sveiby (1997) has a focus on measuring and managing knowledge assets from an employee perspective within three areas; internal, external, and competence. The internal structure, external structure, and competence of people in the firm are evaluated on the criterias growth/renewal, efficiency, and stability. The difficulty with intangible reporting was described by the author when it was released and still applies such as that firms find it pointless to measure indicators if those can not be connected to financial results and a fear that these types of numbers give too much information away which makes it difficult to benchmark. For the BVH, this method becomes interesting since the competence transfer between the large company and the small companies is a key value proposition. In an innovation setting, outcomes such as cultural impact can be valued at the same level as financial measures, and for non-profit initiatives it does. However, the original framework is designed for a firm rather than a collaborative network. Since the framework is focused on intangible assets it also excludes the tangible assets that constitute a part of BioVentureHub's value proposition.

5.1.1.3 Performance Prism

The Performance Prism by Neely et al. (2001) is used as a complement when developing key performance indicators with the stakeholders in focus. The model is taking stakeholder satisfaction, stakeholder contribution, strategies, processes, and capabilities into consideration. The model takes all stakeholders and their needs into account when de-

veloping metrics, including; investors, customers, employees, and suppliers, instead of starting with the strategy of the company. In this specific study, there are several stakeholders, and their needs are highly important when developing the right type of key performance indicators. This model, however, does not mention innovation as a perspective, which is one of the key aspects of this study. This has been stated when the framework has been evaluated by other scholars. Ivanov & Avasilcăi (2014), however, argues that it can still be measured through two of its components: processes and capabilities. The Performance Prism is a good model to use as a complement when developing an understanding for the organization and the needs of the stakeholders, however, it should be combined with a performance measurement framework.

5.1.2 Performance measurement models for innovation

Besides the traditional frameworks for measuring and managing performance, some new models have been proposed with the main focus on innovation by several scholars. The classical measures of innovation include R&D impact, such as R&D budget as input and patent submissions, and new product developments (NPDs) as outputs. But these classical measures are deemed imperfect since they do not influence the prospects of projects nor suitable for SMEs and service industries (Adams et al. (2006)). However, these measures are still widely used in businesses due to the ambiguity of innovation (Tidd et al. (2005)). The result, therefore, presents new alternative categories for measures that are aimed towards dealing with the uncertainty of innovation management and better fit contexts like the BioVentureHub.

To understand the already existing models for the measurement of innovation, a literature review was made using both keywords and citation analysis. Six of these models were chosen since they are providing different perspectives. Three of them give a general perspective of innovation performance measurement, two of them are focused on innovation capabilities in SMEs and one on a business model perspective.

5.1.2.1 General perspective

The three first columns in the overview table, Table 5.1 show what parameters that are important to consider within a general innovation perspective. Adams et al. (2006) did a systematic literature review on innovation management and proposed a framework with seven dimensions for innovation management measurement. The seven dimensions being; inputs, knowledge management, innovation strategy, organization and culture, portfolio management, project management, and commercialization. The first dimension, input, has previously focused on the financial input but should also include measures of human and physical resources and tools for generating new ideas. Soft metrics for inputs in innovation management, such as knowledge, is still lacking and is needed for a balanced set of measures. Knowledge management includes a firm's capabilities for idea generation, knowledge repository meaning the accumulated knowledge in a firm, and information flows such as information gathering and networking. Furthermore, the information flow has three measurement approaches; the linkages between the innovating group and external sources, internal information gathering processes, and finally linkages to customer information flow. Innovation strategy is divided between two measures, strategic orientation meaning if an organization has a strategy and if so, strategic leadership meaning if the organization has the leadership to implement the strategy into action. Organizational culture and structure is a broad dimension that concerns the way

employees are grouped and the organizational culture of the context they are within. For culture, several concepts are important from autonomy to shared vision and trust. Portfolio management is needed to manage how resources are consumed in an innovation process in order to govern projects. Project management concerns the processes that turn the inputs into innovations on the market and is usually measured in terms of efficiency and speed. Lastly, commercialization is focused on the final step of introducing new products or services to markets. One drawback with the framework is that it despite the thorough review of existing literature lacks the quality aspect of innovation.

Muller et al. (2005) offers a framework for metrics that can be used to track and promote innovation success in companies. The framework is constructed as a matrix for the measurement of innovation. The matrix has been divided into three categories: resources, capabilities, and leadership. These categories are measured in three perspectives: inputs, processes, and outputs.

The third model is proposed by Saunila & Ukko (2012) which is based on the balanced scorecard but the categories were adjusted to innovation capability. The framework is used for the measurement of the effects of innovation capability in organizations by providing a link between innovation capability and the business performance outcomes that are measured in the balanced scorecard. Innovation capability in a firm is measured based on three interlinked elements; potential followed by processes which then are followed up by results that lead up to a firm's possibility to attain its business goals measured traditionally using the balanced scorecard.

5.1.2.2 Small firm perspective

Since one of the main aspects of the BioVentureHub is to help small firms to catalyze innovation, two models are described for measuring innovation capabilities in SMEs. These two models with their parameters are shown in the columns in the middle of the overview table, Table 5.1.

Capaldo et al. (2003) developed a method for evaluating innovation capabilities in small software firms. The framework uses a resource-based view for assessing the degree of market innovation capability and technological innovation capability based on four clusters of resources. First, entrepreneurial resources includes internal know-how as well as entrepreneurial experience within or through external linkages to the firm. Second, measure the human resources both the amount and kind, including job-rotation for increased knowledge and access to external consultants. Third, highlights the importance of access to external linkages such as collaborations with other firms. The fourth and final measure is a financial measure focused on measuring profit from commercialization.

Another model for evaluating innovation capabilities in small firms by Saunila & Ukko focuses specifically on intangible assets. The model assesses seven categories; participatory leadership culture, ideation and organizing structures, work climate and well-being, know-how development, regeneration, external knowledge, and individual activity. (Saunila (2014), Saunila & Ukko (2014))

5.1.2.3 Business model innovation perspective

The last column in the overview table, Table 5.1 shows what parameters that are important to consider within business model innovation. Except measuring innovation in a general way or within a small firm, Clauss (2017) has suggested what measures are valuable within business model innovation. He argues that business model innovation is divided into three areas; Value Creation Innovation, New Proposition Innovation, and Value Capture innovation. Value creation innovation has been divided into four subcategories that are important when creating value; new capabilities, new technologies/equipment, new processes and structures, and new partnerships. New proposition innovation is also divided into four categories including; new offerings, new customers and markets, new channels and, new customer relationships. Lastly, important subcategories when assessing value capture innovation are; new revenue models and value cost structures.

All of these models provide guidance when choosing categories appropriate for finding relevant metrics in an innovation setting both from the general perspective, the small firm perspective, and the business model innovation perspective.

Table 5.1: Overview of innovation performance measurement models

General innovation perspective			Small firm perspective		Business model perspective
Adams, Bessant & Phelps (2006) Seven dimensions for innovation management	Muller, Välikangas & Merlyn (2005) Categories for innovation metrics	Saunila & Ukko (2012) Elements for measuring innovation capability (subjective or objective or both)	Capaldo et al. (2003) Innovation capability evaluation method with four resource sets	Saunila & Ukko (2013) Innovation capability in SMEs	Clauß (2017) Measures within Business model innovation
Inputs - People - Physical and financial resources - Tools	Resources - Input - Process - Output	Potential - Leadership and decision-making processes - Organizational structures and communication - Collaboration and external links - Organizational culture and climate - Individual creativity and know-how	Entrepreneurial resources	Participatory leadership culture	Value Creation Innovation - New capabilities - New technologies/equipment - New processes - New partnerships
Knowledge management - Idea generation	Capabilities - Input - Process - Output	Processes - Idea creation and assessment	Human resources	Ideation and organizing structures	New Proposition Innovation - New offering - New customers and markets - New channels - New customer relationships
Innovation strategy - Strategic orientation - Strategic leadership	Leadership - Input - Process - Output	Results - New products or services - New procedures or ways of action	Resources arising from external linkages	Work climate and well-being	Value Capture Innovation - New revenue models - Value cost structures
Organization and culture - Culture - Structure			Economic resources	Know-how development	
Portfolio management - Risk/return balance - Optimization tool use				Regeneration	
Project management - Project efficiency - Tools - Communications - Collaboration				External knowledge	
Commercialization - Market research - Market testing - Marketing				Individual activity	

5.1.3 Measuring innovation performance within a collaborative environment

Innovation has become a much more common term where the individual firm has in a much wider range the possibility to be a part of an open innovation collaborative network. The BioVentureHub is a collaborative network, where the public sector and private companies have the possibility to meet and catalyze innovation through a private-public partnership model, and this is something to have in mind when developing key performance indicators. To understand the already existing models for the measurement of collaborative networks, a literature review was made using both keywords and citation analysis. Five of these models were chosen since they are providing different perspectives. Three of them give a general perspective of performance measurements within a collaborative network and two of them are focused on collaborative networks including several stakeholders, such as private and public partners.

5.1.3.1 General collaborative network perspective

The three first columns in the overview table, Table 5.2 shows what parameters that are important to consider within a general collaboration network perspective.

When defining measurements, there is always a need for understanding the context, process, and content of an organization, and the same needs to be done when defining key performance indicators for a collaborative environment (Cuthbertson & Piotrowicz (2011)). The authors have introduced a revised framework for analyzing the network performance management system. The framework includes several network factors when creating key performance indicators and those factors are; industry/sector, relationships, number of participants, stakeholders, strategic goal, maturity, geographical location, and products. Cuthbertson & Piotrowicz (2011)

Pekkola & Ukko (2016) has suggested a five-step procedure based on existing literature and empirical studies on how to go about when designing performance measurements within a network, and their result is that the main process factors that are needed in the design of measurements in networks are; socialization, participation and information sharing.

In order to become a collaborative network, Pekkola & Ukko (2016) also argue that one important aspect is to measure the maturity of the interactions of the network. There are four different maturity levels to become a collaborative network and they are dependent on how integrated the actors are within the network. In order to reach a high maturity and integration level, the collaborative network should have joint goals, joint identities and they should also be working together and have joint responsibility. Figure 5.1 describes what is needed in order to reach the highest level.

Interaction Maturity level				
Collaborative network	Communication & information exchange	Complementarity of goals Aligning activities	Compatibility of goals Individual identities Working apart	Joint goals Joint identities Working together (creating together) Joint responsibility
Cooperative network	Communication & information exchange	Complementarity of goals Aligning activities	Compatibility of goals Individual identities Working apart	
Coordinated network	Communication & information exchange	Complementarity of goals Aligning activities		
Network	Communication & information exchange			
				Integration level

Figure 5.1: Interaction maturity levels

Source: Pekkola & Ukko (2016)(modified from Camarinha-Matos et al., 2009, p. 3).

Parung & Bititci (2008) mean that the most important objective of collaboration is creating value and benefits for its stakeholders. To find metrics that will work in a collaborative network and make sure there is a low risk of disagreements, the authors argue that defining success and measurement attributes together within the collaboration network is a way of lowering those risks.

The model suggests three measurements aspects that may influence the success of a collaborative network;

- **Input to the collaboration;** The input of a collaboration includes all the resources every stakeholder is contributing to the collaborative network. Measuring the contribution of a participant is tricky. However, Parung & Bititci (2008) suggests using an AHP model, where a contribution weighing system is used.
- **The health of the collaboration;** The higher the commitment of the collaboration, the better collaborative network. Five different parameters are proposed to measure the health of the collaboration, and those are; trust, coordination, commitment, communication quality & participation, and the conflict resolution technique for joint problems. The authors also mention that one of the biggest problems with implementing key performance indicators within the health of the collaboration is to reach a consensus within the network.
- **Output of the collaboration;** Output of the collaboration are the results and benefits of being a participant in the collaborative network. Earlier research shows that it is hard to measure the outcome of a collaboration with only one criteria. The output of a collaboration is often linked to the performance of a collaboration, and earlier performance measures are most often linked to a single organization and not to a collaborative network. A collaborative network can be seen as one organization by doing some changes in ordinary performance measurement frameworks.

5.1.3.2 Collaboration between public and private actors

The two last columns in the overview table, Table 5.2 shows what parameters that are important to consider within a collaboration between public and private actors. Yuan et al. (2009) have focused their study on how the performance of a PPP could be measured in order to achieve value for money. The authors mean that previous research on PPP:s has mainly been focusing on the success management, risk management, and procurements, and little attention has been given to process factors that are important when it comes to the performance of a PPP. There is a belief that the process and performance management will improve if metrics and the outcome of the collaboration are identified beforehand, and this will lead to an improved partnership. The authors have suggested KPIs within five areas; the perspective of physical characteristics of projects, financing and marketing, innovation and learning, stakeholders, and project success.

Edmunds Laurel & Et.al (2019) argues that there is a lack of quantifiable indicators for the triple helix innovation model within life science and medical clusters. The authors have created a model from their innovation cycle that is divided into three phases; input, innovation system activity, and outputs. Within every phase, there are several proposals for indicators. Within input indicators, Edmunds Laurel & Et.al (2019) suggests measures within scientific knowledge, research funding, human capital, and research infrastructures. The indicators proposed within the innovation system activity are within the existing level of innovation, the support for innovation, and the quality of the innovation infrastructure. The outputs are measured through five categories; biotech jobs, the amount of capital, number of biotech products, number of big trade sales, and number of companies.

All of these models provide guidance when choosing categories appropriate for finding relevant metrics in a collaborative network both from the general collaboration network perspective, and more specifically collaborative networks such as Triple helix innovation models and PPP:s.

Table 5.2: Overview of the collaboration performance measurement models

General collaborative network perspective			Collaboration between public and private actors	
Cuthbertson and Piotrowicz (2011): important network factors	Pekkola & Ukko (2016): main process factors in networks	Parung and Bititci (2008): Three measurement aspects that may influence the success of a collaborative network	Yuan et al (2009): Process factors important when it comes to the performance of a PPP	Edmunds Laurel et al(2019): Indexes for a triple helix innovation model within life science
Industry/Sector	Socialization	Input to the collaboration - Using a contribution weighing system (AHP model)	Physical characteristics of projects	Input - Scientific knowledge - Research funding - Human capital - Research infrastructures
Relationships	Participation	The health of the collaboration - Trust - Coordination - Commitment - Communication quality & participation - The conflict resolution technique for joint problems	Financing and marketing	Innovation system activity - Existing level of innovation - The support for innovation - The quality of the innovation infrastructure
Number of participants	Information sharing	Output of the collaboration - The performance of the collaboration	Innovation and learning	Output - Biotech jobs - The amount of capital - Number of biotech products - Number of big trade sales - Number of companies
Stakeholders	Maturity		Stakeholders	
Strategic goal			Project success	
Maturity				
Geographical location				
Products				

5.2 The Intent for the Stakeholders to be a part of the Initiative

This section is answering RQ2. This has been made by analyzing the answers from the interviews with the stakeholders. When evaluating the intent from each stakeholder to be a part of the initiative, coded themes such as, what the stakeholders perceive as the goal of BVH, the background for joining and the wished future outcome of the initiative was considered.

Table 5.3 shows an overview of all the concepts that each stakeholder has mentioned as the intent for being a part of the initiative. The ones that are highlighted in bold are the ones that each stakeholder has seen as the core reasons for joining the initiative.

Table 5.3: Overview of what the stakeholders mention as the intent for joining BVH. The most mentioned ones are highlighted in bold.

Investors	AstraZeneca	SMEs
Life Science Ecosystem	Life Science Ecosystem	Life Science Ecosystem
Collaboration	Collaboration	Collaboration
Reputation/Brand	Reputation	Reputation
Favourable for companies	Competence to AZ	Competence exchange
More and bigger companies	Better use of resources/ infrastructure	Infrastructure
Internationalization	Culture	Co-localization and community
Growth SMEs	Favourable for SMEs	Growth
AstraZeneca Incitement	Competitiveness	

5.2.1 Investors

There were several reasons for the Swedish government to be a part of investing in the BioVentureHub initiative including; efforts for strengthening the life science ecosystem, collaboration, a favorable environment for companies, the growth of SMEs, and an incitement for AstraZeneca to stay in Sweden.

One of the main goals when it comes to the life science industry is to increase and help small companies to grow and stay in Sweden. This is a challenge since many companies either do not survive the valley of death or get bought by a larger company when they reach a certain level, and this means most likely leaving Sweden as well. Today there are mainly startups and large companies in the life science industry and there is a need for closing the gap in between. One reason for investing in the initiative is the curiosity and belief in what interactions and collaborations between these small companies and AstraZeneca could bring to the society. Besides surviving the valley of death and growing as a company for SMEs, there is also a good way to exchange competences and equipment between actors.

When investing, BVH was seen as a new innovative model for collaborating between large and small actors. It was outside the scope of AstraZeneca's usual business with a clear benefit for the small companies that could fill a gap in the innovation system which motivated the investment. Furthermore, a benefit from this was that the collaboration

model could be tested in other sectors as well.

There is also a high interest when it comes to creating a life science cluster to make sure Gothenburg is an obvious choice when deciding where to locate a new or existing life science company. By having a cluster in the Gothenburg area, there is also a hope to increase the number of employments and innovations in Sweden. Another interest Sweden has in the life science industry is keeping AstraZeneca in Sweden since there are not many other companies in the same size within the industry. If Sweden would lose AstraZeneca, they would lose several job opportunities, but they would also lose credibility and brand within the life science industry.

5.2.2 AstraZeneca

For AstraZeneca, there were several reasons for creating the BVH including contributing to the life science ecosystem, collaboration, competence to AstraZeneca, culture change, and that it would be a favorable environment for SMEs.

First of all, they saw that the site demanded something new when AstraZeneca moved both R&D sites in Lund and Södertälje to Gothenburg. The amount of innovations in the pharma industry was also decreasing and they needed a way to change that trend. By trying something new out, there was a hope that the site could be more innovative and open at the same time as this was a way to show the employees that the site was expanding.

AstraZeneca also saw a need for competence they usually do not hire and one reason for opening the hub was to learn new things from the people working in smaller life science companies. By opening up the site to smaller companies, there was a hope that the culture at the site would open up and that this would increase new ideas and innovation. AstraZeneca also believed this was a way of making their Gothenburg site more unique and attractive as a place to work at and to show themselves as an active partner.

Besides benefitting AstraZeneca directly, the company also saw a need for a life science ecosystem in Sweden and the Gothenburg area which was highlighted by the Ingvar Carlsson evaluation together with AstraZeneca's own evaluation. By creating the hub, AstraZeneca thought this could be one step in creating a collaborative ecosystem between different actors in the life science sector, and AstraZeneca wants to be a company aiming for collaboration. By having a life science ecosystem in Gothenburg, both Gothenburg and Sweden would benefit from it since this would most likely increase the number of collaborations, including between sectors, jobs, and the number of companies situated in the Gothenburg area.

By letting small life science companies sit in the heart of AstraZeneca, they could benefit from both laboratories, premises, and competence at the site, at the same time as AstraZeneca could rent out spaces they did not need anymore. Their hope and belief were that this could help the companies survive the valley of death. For AstraZeneca, the benefit of allowing companies to sit inside the site in a hub is bringing small life science companies closer to the company without formal business arrangement with AstraZeneca.

5.2.3 SMEs

The main reasons why companies apply for being a stakeholder to the BVH are not surprisingly similar to the offer given; infrastructure, growth opportunities, access to competence and, to be part of a community and life science ecosystem.

The first reason for companies deciding to become a stakeholder to the BVH is the access to the existing physical infrastructure at AstraZeneca, for the high standard and since there is a lack of equal offers in Gothenburg. Besides co-located offices with labs, access to the existing surplus infrastructure such as restaurant and conference premises further adds to the interest in the physical infrastructure. When companies need larger office space they scan the area in Gothenburg and find that BVH has the physical infrastructure but also offers additional value. The additional value that the companies see when applying is the possibility of access to expertise from the large company and other companies inside the hub. Both the in-depth advice but also the benefit of being located with similar companies that are facing the same development phases. Connecting to the third reason, of being located in a life-science ecosystem with the large actor meeting the smaller ones, the community aspects of being part of something bigger than themselves but also the negative aspects of the ecosystem being underdeveloped.

5.2.3.1 Differences of the intent between Medtech and Pharma SMEs

Differences in the intent of the companies developing a Medtech product compared to the Pharma product developing companies could be seen. The Medtech companies had a bigger intent concerning the co-localization with other companies while the intent of drug developing companies is more focused on access to AstraZeneca both in terms of expertise but also collaboration. The value concerning physical infrastructure among the companies was understood to be higher for the Medtech companies since they seem to be utilizing the labs to a larger extent while drug companies seem to work more as skeleton organizations using Contract Research Organizations (CROs). The drug product companies are instead interested in factors that are directly related to the financial growth of the companies in the hub when entering. Such as that the environment could contribute to a better financing climate in terms of attracting investors is one expectation even if it is not an explicit value offering by BVH. However, for the future, both company groups want to see an even more buzzing community and easier processes for finding complementary competences for collaboration. The companies hope that they together with the stakeholders could increase access to financing, even if it falls out of the scope of the BVH.

Table 5.4: Comparison of the intent between Medtech- and Pharmaceutical SMEs

Medtech SMEs	Pharma SMEs
Infrastructure	Infrastructure
Life Science Ecosystem	Life Science Ecosystem
Co-localization and community	Co-localization and community
Collaboration	Collaboration
Growth	Growth
Reputation	Reputation
Competence exchange	Competence exchange

5.2.3.2 Differences of the intent between SMEs with or without earlier connections to AstraZeneca

Several of the companies in the hub have former AstraZeneca employees in their company. The former employees come either from the start when an AstraZeneca employee decides to start a company or from cases where AstraZeneca employees have transferred to one of the smaller companies. The companies with a former AstraZeneca employee have easier access to AstraZeneca competence since they can have informal communication with former colleagues. Remaining in the same environment makes the BVH a natural choice for companies started by AstraZeneca employees.

5.2.3.3 Differences of the intent between company entry time

A difference in intent could also be seen between the early entrants and the late ones. The recent entrants discuss expectations on culture and community to a larger extent as a reason for joining. At the same time, the presence of companies further down the development chain is appreciated both for their expertise and their larger presence.

5.3 Value that has been added to the Stakeholders by being a part of the Initiative

This section is answering RQ3. This has been made by analyzing the answers from the interviews with the stakeholders. As the initiative has existed for five years, the stakeholders have been given questions regarding what value has been added using additional coded themes such as, important processes, innovation capabilities, their needs, and results that have been identified.

Table 5.5 shows an overview of all the concepts that each stakeholder has mentioned as valuable ones when being a stakeholder to BVH. The ones that are highlighted in bold are the ones that each stakeholder has seen as the core value that is or should be added to the initiative.

Table 5.5: Overview of what value that has been added for each stakeholder. The core ones are highlighted in bold.

Investors	AstraZeneca	SMEs
Life Science Ecosystem	Life Science Ecosystem	Life Science Ecosystem
Collaboration	Collaboration	Collaboration
Reputation/Brand	Reputation	Reputation
Favourable for companies	Competence to AZ	Competence exchange
More and bigger companies	Better use of resources/ infrastructure	Infrastructure
Internationalization	Culture	Co-localization and community
Growth SMEs	Favourable for SMEs	Growth
AstraZeneca Incitement	Competitiveness	

5.3.1 Investors

BVH has become an alternative environment for the already existing incubators and accelerators in the Gothenburg area. The hub has been a part of creating a shared vision

about life science in Gothenburg and Sweden, and it has been a driver for creating interactions between the industry, academia and public sector.

The evaluation of BVH that has been presented to the investors shows that both the companies in the hub and AstraZeneca are happy with the support and environment that is existing, which is seen as pleasing from an investor point of view. The result that the investors see as valuable is that they have attracted new companies to the region, both national and international, and there has been a possibility for companies to grow and use knowledge, equipment, and competences. The investors want BVH to continue working to create companies that will grow and survive in Sweden.

BVH has also managed to facilitate collaborations with companies in other sectors and to share their model with companies that would like to create similar hubs, which is increasing the value of the region. What is missing is the collaboration within the innovation system in Gothenburg.

By creating this environment, the reputation of Gothenburg as a life science ecosystem has increased, which has been crucial when attracting companies and competence to Sweden and Gothenburg.

Another important result is the mobility of competence. There have been some transfers between companies and AstraZeneca, and in future development, an easy and comfortable way of exchanging knowledge is seen as crucial.

From the investors' point of view, the result of starting the BVH has also created a culture at AstraZeneca built on trust and a braveness in sharing and opening up R&D environments with companies that do not belong to the big pharma company, which is perceived as valuable.

5.3.2 AstraZeneca

Today, AstraZeneca feels that they have been a part of developing a life science ecosystem in the Gothenburg area. Through contributing to the life science ecosystem, results such as creating more jobs, combining companies between sectors and an increased network towards SMEs have been direct outcomes.

What they did not expect when starting the initiative was the impact on the reputation of both AstraZeneca and the companies in the hub. AstraZeneca has gotten both positive attention in the form of important visits and an increased reputation from being an innovative and open partner that is willing to collaborate. A result of getting attention is that they have started new collaborations with different types of organizations. An intent from AstraZeneca's side is that it should be beneficial for the SMEs to be a part of the hub. A positive result is therefore that the companies can get a good reputation when being associated with AstraZeneca and the BioVentureHub. BVH has also inspired other companies and sectors to create similar environments, which is seen as a positive outcome.

By creating the BVH, one result has been the utilization of technology, in the form of a spin-off, that existed within AstraZeneca but could not be further developed within the company. Another example is that it has become a platform for new types of collaboration that otherwise might not have happened, such as academic collaborations. Some of

their resources and facilities are better used by the companies than by AstraZeneca who did not use them. However, there is a need to further explain what AstraZeneca and the hub can help companies with, to maximize the usage of resources.

The BVH has offered possibilities for different organizations and people to interact at the heart of AstraZeneca. These interactions have resulted in several collaborations, both between the companies in the hub, between companies and AstraZeneca, and multidisciplinary with companies in other sectors. Even if AstraZeneca is not an active partner of every collaboration, it is still seen as beneficial that it is happening inside the walls of the site.

Another outcome that has been seen at the site is a change in culture. Which aspects that have contributed to the changing culture is difficult to conclude, but BVH is seen as a contributing factor. The site has a much more open and positive attitude, but there is still a need to develop and continue to create an open environment for the employees at AstraZeneca.

One intent for AstraZeneca to start the initiative was to gain knowledge and competence from the SMEs. Until now, there have been a few job rotations but it has been clear that one aspect that needs to be further developed is creating more value and competence for AstraZeneca. The companies situated in the hub have had the possibility to gain knowledge and competence from each other and AstraZeneca, and one result is that several employees from AstraZeneca have transferred to the companies. However, one thing that is missing is the communication of success stories from BVH regarding the companies that are situated in the hub, both in terms of growth of the companies but also examples of successful collaborations and interactions with AstraZeneca.

5.3.3 SMEs

One of the most valuable concepts is the physical infrastructure the hub has created. By being a part of the AstraZeneca and BVH infrastructure, companies have had access to equipment of high quality, premises, and laboratories.

By being situated in the hub, several collaborations and knowledge exchanges have been carried out both between the companies and some between the companies and AstraZeneca. There is a belief that this would not have occurred without the companies being located in the hub. However, some companies also had higher expectations of getting help and time from AstraZeneca. Most collaborations have been between either a Medtech/Pharma company and one of the service companies inside the hub.

As mentioned earlier, several companies had expectations of getting help with financing to accelerate their growth and business, however, this falls outside of BVHs scope. Even so, this is something that has not lived up to their expectations and there is a feeling that Gothenburg has a limited focus when it comes to helping increasing company growth.

Except for internal value, reputation is something that has created value for the companies in the hub. Some companies feel that they get attention and credit for being under the same roof as AstraZeneca and perceive that they have gotten an external stamp of approval as one of the companies that have the opportunity to be in the hub.

Lastly, the companies have seen the community as a valuable component in the existence of the hub. By having a community, the companies have had the possibility to share thoughts in an open environment at the same time as having the possibility to talk to employees at AstraZeneca. Even if there is an openness and willingness to share, several companies have mentioned that there is a feeling of not sharing information about mistakes and finding investment. They also mention the lack of an environment where the companies can meet spontaneously in connection to their office space.

5.3.3.1 Differences of the value added between Medtech and Pharma companies

There are some differences in what Medtech and Pharma companies see as valuable, even if they to a large extent see the same concepts as the valuable ones being the community, the infrastructure, collaboration, and competence exchange. The difference is that the Medtech companies see reputation as something that is adding value to their organization and brand towards customers as well. For an overview, see Table 5.6 .

When it comes to the community and co-localization, the Medtech companies are more positive and find the community more valuable than the Pharma companies do. Some Pharma companies do not see the value of the interactions that are happening by being located in the same hub. There are some previously employed AstraZeneca employees in the Pharma companies, and several have mentioned that they think that their main interactions with other AstraZeneca employees happen because of their relationship to their old colleagues, and not because of the hub.

The infrastructure has been valuable for both Medtech and Pharma companies. Both see the premises, laboratories, and the services that are added to the infrastructure as highly valuable.

The third and fourth concept that both company groups see as valuable are collaboration and competence exchange. Medtech companies have found the exchange of experiences and the supply of service companies as the most valuable components. Pharma companies have found interactions with AstraZeneca more important, but some of the companies do not think the interactions have been enough. They also see the formal collaborations formed with other companies in the hub as valuable.

Table 5.6: Comparison of the value added for Medtech- and Pharma companies

Medtech companies	Pharma companies
Life science ecosystem	Life science ecosystem
Infrastructure	Infrastructure
Collaboration	Collaboration
Growth	Growth
Reputation	Reputation
Community & Co-localization	Community & Co-localization
Competence exchange	Competence exchange

6

Discussion

In this chapter, the MRQ will be answered. This has been made by combining the answers from RQ1, RQ2, and RQ3. The upcoming sections will describe how saturated categories followed by KPIs and metrics were developed.

6.1 Development of Categories

6.1.1 Comparison and concept saturation between stakeholders

By combining the results from what every stakeholder sees as the intent and the value that has been added to them by being a part of the BioVentureHub initiative, the concepts from every stakeholder group were compared with each other, see Table 6.1. When comparing and combining the results, the intent, and the value that has been added was saturated into one concept for every stakeholder. The combinations of what every stakeholder sees as important resulted in a summary of eight concepts that can be seen in the column, "concept summary". These eight concepts are the most relevant ones to every stakeholder, and by relevant, this means that there are things that are both good, and in need of improvement in order to make sure that BVH is living up to the expectations the stakeholders have on the initiative.

When we were in the process of combining concepts, we could see that many of them were similar to each other, and even if the stakeholders may have had different perspectives, we could see that they were moving towards reaching the same overall goal. The goals of the investors were on a much broader level, including the ecosystem of Sweden and thoughts about how to improve the environment for AstraZeneca, SMEs, and other relevant actors. AstraZeneca and the companies had the overall ecosystem in mind, but their main goal is of course to improve their own businesses. But the secondary outcome of them performing well is contributing to the ecosystem and also showcasing Sweden's ability to innovate.

Table 6.1: Saturated concepts for the stakeholders

Investors	AstraZeneca	Companies	Concept Summary
- AstraZeneca Incitement - Favourable for companies	Competitiveness		Stakeholder Incitement (AstraZeneca stays in Sweden, competitiveness, favourable for companies)
- Life Science Ecosystem - More and bigger companies	Life Science Ecosystem	Life Science Ecosystem	Life Science Ecosystem (More and bigger companies, internationalization)
Growth SMEs	Favourable for SMES	Growth	Company Growth
Mobility	Competence to AZ	Competence exchange	Competence (Mobility, mentorship, 4D companies)
Collaboration	Collaboration	Collaboration	Collaboration (between actors, cross-collaboration)
Reputation/Brand	Reputation	Reputation	Reputation (companies, AZ, region, attractiveness, stream of companies)
Internationalization	Culture	Co-localization and community	Community (network, interactions, culture and openness)
	Better use of resources/ infrastructure	Infrastructure	Infrastructure (Physical)

6.1.2 Comparison and concept saturation with the help of literature

To decide what categories are suitable to measure within this context, we chose to validate our concepts by combining our stakeholders' most relevant ones with theories on what could be interesting to measure within innovation and collaboration models from RQ1, see Table 6.2. These models addressed the concepts in different ways and gave a holistic view that the concepts we have chosen are relevant when measuring the output of catalyzation of innovation in a collaborative environment. The theories gave us an understanding that there are different measures that are important within innovation and collaboration when merging them with the concepts of our choice. The only concept that was not covered within innovation and collaboration theories was reputation. However, reputation is included in the Intangible Asset Monitor framework, and among the stakeholders and BVH, it is seen as something that has added a lot of value for everyone involved in the initiative.

Table 6.2: Comparison between the concepts and performance measurement models from literature

Concepts	Innovation models	Collaboration models
Stakeholder Incitement (AstraZeneca stays in Sweden, competitiveness, favourable for companies)	Motivation	Stakeholders Strategic goal
Company Growth	New products or services Economic resources Project management Commercialization	Products
Life Science Ecosystem (More and bigger companies, internationalization)		Industry/Sector Geographical location
Competence (Mobility, mentorship, 4D companies)	Creativity and know-how New procedures or ways of action Knowledge management Human resources Portfolio management External knowledge Capabilities	
Collaboration (between actors, cross-collaboration)	Resources arising from external linkages Collaboration and external links	Relationships Coordination Performance
Reputation (companies, AZ, region, attractiveness, stream of companies)		
Community (network, interactions, culture and openness)	Organizational culture and climate Creativity Entrepreneurial resources Work climate and well-being	Maturity Number of participants Stakeholder contribution Trust Commitment Participation Conflict resolution technique for joint problems Information sharing
Infrastructure (Physical)	Organizational structures and communication Resources Communication channels	Communication quality

6.1.3 Validation of concepts and understanding the processes of the BioVentureHub

In order to validate our initial concepts and to get inspiration when developing KPIs and metrics, we decided to have a KPI-workshop with the BioVentureHub team. By choosing

four concepts that needed a deeper explanation, we tried to get an understanding of what processes BVH has and should develop in order to reach stakeholder satisfaction. The chosen concepts were; Collaboration, co-localization & community, company growth and competence exchange to AstraZeneca, seen in Figure 6.1, 6.2, 6.3, 6.4. The workshop was held in Swedish, and therefore, the proposed ideas in the figures are in Swedish. Before the workshop, we were not completely sure how the hub aimed to fulfill the needs of the stakeholders, but this gave us inspiration and further knowledge in order to find suitable KPIs. By involving the team, we wanted to give them the opportunity to be a part of deciding and co-developing processes which we felt was a good way to involve the team for their future work of improving the hub.



Figure 6.1: Ideas on how to increase collaboration



Figure 6.2: Ideas on how to increase co-localization and community



Figure 6.3: Ideas on how to increase company growth



Figure 6.4: Ideas on how to increase knowledge exchange to AstraZeneca

Based on the understanding of the processes of the BioVentureHub from the workshop, and existing inputs and outputs for each stakeholder from the interviews, we were able to map the input, process, and output for each actor in all concepts. The thinking was based on the framework developed by Edmunds Laurel & Et.al (2019). We did this with the reasoning that the outputs of the system can only be the result of how well the processes of the BVH can transform the inputs of all stakeholders into the system. Furthermore, the possible outputs from BVH is a result of the strategy and the goals of the organization. When the outputs were narrowed down, the outcome was a combination of the stakeholder theory and the strategy view described in the theory chapter. The outputs chosen were partly limited by the scope of the organization's strategy and resources, but some outputs for each concept were vital to keep in order to reach stakeholder satisfaction. For example, we could see that by being co-localized a process such as finding collaboration opportunities existed in order to create formal and informal collaborations. However, we could see that one wished output from the companies was getting financing,

but since this was not a process BVH was aimed to work with, this was excluded. And lastly, one existing input was competence and the wished output was giving competence to AstraZeneca, the process for this is not completely existing today, but since this is a very important output in order to reach stakeholder satisfaction, this was still included, see Figure 6.5.

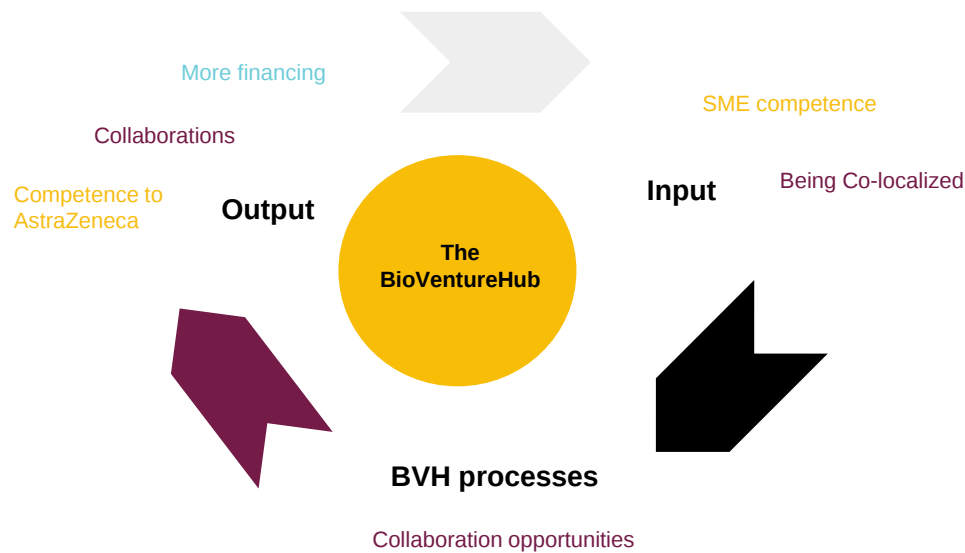


Figure 6.5: The Innovation Cycle of the BioVentureHub

6.1.4 Suitable categories

Understanding and creating KPIs that can measure what value that is captured by the stakeholders rather than just the value that is created was important when we narrowed down the indicators. The concepts were iterated and six final categories were chosen; company growth, infrastructure, competence, community, attractiveness, and collaboration, see 6.3. Two concepts were decided to be excluded as categories and one was redefined. First, stakeholder incitement, since the incitement for every stakeholder partaking was instead encapsulated in each category, for example, the outputs of these six categories should create a favorable environment for SMEs and a competitive advantage for AstraZeneca in the region. Second, the Life Science ecosystem is an important concept but it is included as a goal for the organization. Similar to the stakeholder incitement, life science ecosystem is measured through the other categories instead of by itself. Lastly, Reputation was redefined as Attractiveness since what the stakeholders want to understand is if they are perceived as more attractive by measuring their reputation.

Table 6.3: Saturated categories for performance measurement in the context

Categories	Company Growth	Infrastructure	Competence	Community	Attractiveness	Collaboration
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6.2 Development of KPIs

The KPIs for each category were chosen using our understanding of the BioVentureHub up until now, and the theories from RQ1. An overview of the chosen KPIs for each category can be seen in Table 6.4 and will be described below.

Table 6.4: Chosen KPIs for the context based on the categories

Company Growth	Infrastructure	Competence	Community	Attractiveness	Collaboration
Human resources	Facility	Sector Convergence	Maturity	Reputation	Collaboration
Economic resources	Equipment	Knowledge transfer inside the hub	Culture		
Progression		Entrepreneurial outflow	Engagement		
		Big industry inflow			
		Academic Inflow			

For company growth, the theories for measuring innovation in SMEs resulted in the inclusion of both human resources and economic resources to show the expansion in resources of the companies. Besides resources, the progression of the companies was chosen as a KPI to show that the companies are not only growing in resources, but they are also developing and entering new phases. Measuring progression is a KPI found in innovation performance management where firms are evaluating the development of R&D projects, for BVH however this translates to measuring the development of companies.

The facility and equipment of the infrastructure is suggested as two KPIs since it is a highly valued value proposition.

Competence is one of the most central aspects of this innovation initiative. When choosing KPIs, several aspects needed to be considered. The first two KPIs, the inflow of knowledge both from the big industry companies in collaboration with the hub and from academia was chosen. Second, a KPI was chosen to show the diversity of the knowledge bank and the sector convergence of the desired balance of companies. Third, a KPI was chosen to show that the knowledge within the hub is transferred between the companies. The fifth and final KPI was chosen to show the outflow of entrepreneurial knowledge from the hub companies to the Big Pharma actor. Entrepreneurial knowledge also includes the field expertise from each SME. All of these KPIs are influenced both by innovation models but also the theories of open innovation for inflow and outflow of knowledge but also with the addition of academic inflow from the triple helix model. Furthermore, understanding what complementary assets that each actor contributes with, needs for cross-sector innovation, and commercialization are parameters highlighted by theory.

In order to make sure that the community of the BioVentureHub is living up to the expectations of the stakeholders, theories have shown that a well-working community involves increasing the engagement, the culture, and maturity, and therefore they were chosen as KPIs. By being engaged in the community, there is a belief that the culture will increase

as well. But at the same time, engagement and culture do not implicitly result in a mature network. A community that is mature will most likely have some aligned goals, activities and knowledge except having engaged participants and a likable culture.

Attractiveness was chosen as a category with reputation as the KPI since it is seen as a valuable output for the stakeholders. A valuable output seen is that BVH can increase visibility for small companies and the ecosystem at large. We see that the overall reputation is a key input for the other categories such as company growth, competence, and collaboration in order to attract resources to the hub. Resources that are key for a collaborative innovation initiative to succeed and prosper.

Collaboration is the last category and KPI. In order to increase innovation in a context like this, there is a belief that the value proposition will be collaboration. By keeping track and coordinating what kind of collaborations that exist, there will also be a way of seeing if this initiative has resulted in new collaborations between large and small companies, research actors, and companies within different sectors. There will also be a possibility to see if these new collaborations have been able to create new product and service innovations and if they create value.

6.2.1 Connecting the KPIs to the goals of the organization

The KPIs were distributed between the goals, see Table 6.5, of the organization since an important aspect for KPIs is that they can show how well the organization fulfills its goals. The KPIs chosen resulted in a good span across the goals, which again shows that the current and future processes by the BVH team are aligned with its goals, and otherwise it can show where processes are currently missing.

Table 6.5: KPIs for each goal of the organization

	Create an environment that facilitates the translation of research findings and discoveries into innovations, products, and companies within life science	Provide a well-functioning life science ecosystem for sustained growth and job creation	Promote internationalization and a collaborative culture	Create new ways for catalyzation of innovation through sector convergent collaborations
Company Growth	Progression	Economic resources Human resources		
Competence	Sector convergence		Sector convergence	Academic inflow Big industry inflow Entrepreneurial outflow
Collaboration	Collaboration			Collaboration
Attractiveness	Reputation BVH	Reputation companies	Reputation AZ	
Community			Maturity Culture Participation	
Infrastructure	Facility Equipment			

6.2.2 Developing metrics from KPIs

In order to capture the soft values and the quality, our suggested way forward is to measure the KPIs with both hard and soft metrics. The hard metric shows evidence of the opportunities created by the processes in the hub, while the soft metrics act as a way to measure how well actors in the network capture the value created by others. The aim is to be able to show an overall picture of the innovation environment. For example, Progression; the hard metric would be how many of the hub companies that have moved to the next development stage and the soft metric would be the number of companies that feel that BVH has contributed to that progress. The ambiguity of innovation is difficult to account for. But the standing point chosen is that if the environment can show that the sought value from the stakeholders has been created and that the stakeholders feel that they have captured that value is the best possible way to show the effectiveness of this type of innovation environment.

For progression, the hard value will measure whether or not the companies in the hub have moved forward in development based on decided milestones for each value chain. The milestones should be decided based on the typical development of Pharma-, Medtech-, digital health- and diagnostic companies. The perception if BVH has contributed to the development is a corresponding soft metric.

Typical financial metrics are suggested to measure the increase in economic resources of the companies and since mediating financial help is not a process for the BVH, no soft metric is suggested to measure the contribution of BVH.

The human resources is suggested as a KPI to measure both the number of full-time employments (FTEs) but also the increase through new recruitments. In a life science context, the use of service companies and consultants is common, to show the increased number of jobs created and the growth in human resources it is therefore suggested to include external FTEs, such as consultants. To reach the goal of the investors, to create more jobs in the region, one suggestion is measuring the total amount of FTEs.

Facilities is measured through the number of companies utilizing office- and lab space and if the amount of space that is used is increasing. Similar metrics are suggested for equipment where instead the utilization of service and instrumentation is measured. For both, the company satisfaction is measured as the corresponding soft metric. The infrastructure serves as one of the most important value proposition because of time saved and access to a combined lab and office space. Measuring time- and money saved, is however difficult without comparison with companies without similar access, therefore, measuring the company satisfaction with the infrastructure is deemed enough.

Metrics for the measurement of reputation can usually be done by calculating the PR value. In order to provide indicators of BVHs effect on the reputation, additional metrics have been suggested. Including press mentionings and through average valuation. As corresponding soft metrics, the perception of having a stamp of approval and the probability of recommending BVH is suggested to be measured from the companies in the hub.

In order to keep track of the sector convergence, there should exist hard metrics covering the diversity of companies, nationalities, and academic groups to make sure the desired balance exists within the hub. Secondments and recruitments between actors are suggested measures, both in between companies, the Big Pharma company, and academic groups. In order to make sure competence is flowing between the big industry, universities, the Big Pharma company, and the companies situated in the hub, formal events such as lectures, projects, and mentorship programs are examples of interesting measures to follow up. Once again, the perception of the involved actors will be the interesting soft measures to combine and compare with the proposed hard values.

When measuring maturity, culture, and engagement, the focus will mainly lie on soft values. In order to understand if a community is satisfying to its stakeholders, the perceptions of the community will be the core metrics. However, in order to measure how engaged people act in a specific community, the suggestion is to measure the amount of informal events that occur, such as lunch and breakfast events. There is also interesting to keep track of how many companies and employees that are participating in events that are arranged. When it comes to engagement and its soft metrics, a proposal is to measure the perceptions of having occurring contact with interesting actors and people.

Lastly, the KPI collaboration will also have several hard and soft metrics. When it comes to the hard metrics, the importance lies within seeing how many formal collaborations that exist between all engaged actors; The Big Pharma company, Big Industry partners, the

companies including cross-sector companies, and finally academic collaborations. Even if there are several collaborations, this does not mean the outcomes of them has resulted in something astonishing by itself, and therefore, the success stories and the perception of the parties involved in the collaboration will be measured as soft values.

As a final overview, metrics, both in order to evaluate the hard values and soft values of each KPI are shown below in Table 6.6, 6.7 and 6.8 as an overall mapping.

Table 6.6: Examples of hard and soft metrics to use in order to measure the proposed KPIs within the categories; company growth, infrastructure and attractiveness.

Categories	KPIs	Metrics hard	Metrics soft
Company Growth	Progression	Development stage - Clinical study development - Regulatory development - New products - New patents - New publications - New national/international office space - New customers	- Perception that the hub has contributed to the company growth in terms of development
	Economic resources	Capital in - Sales - Funding - Venture Capital Revenue	
	Human resources	Internal FTEs External FTEs New recruitments	- Perception that the hub has contributed to the company growth in terms of human resources
Infrastructure	Facilities	Total office/lab space in use No. of companies	- Company satisfaction in terms of facilities
	Equipment	Usage of service catalogue Circular instrument usage/ sharing of equipment	- Company satisfaction in terms of equipment
Attractiveness	Reputation (BVH/Big Pharma/ BVH Companies)	PR value (Big Pharma, BVH, companies) Big Pharma - Press metinonings Big Pharma+BVH BVH - Number of applications to the hub SMEs - Average series A/B valuation	BVH - Companies would recommend the hub to others SMEs - Perceive a stamp of approval by being a part of the hub

Table 6.7: Examples of hard and soft metrics to use in order to measure the proposed KPIs within the category competence.

Categories	KPIs	Hard Metrics	Soft Metrics
Competence	Sector convergence	- Company diversity (desired balance) - International companies - Academic groups	- Perception of getting knowledge from cross-sector companies
	Knowledge transfer inside the hub	- Secondments (between companies) - Recruitments (between companies)	- Perception that BVH companies have gotten new competence from other hub companies that has been valuable for their development
	Academic inflow	- Academic secondments - PHDs - Postdocs - Projects with schools - Master's Thesis - Academic founder	
	Big industry inflow	- Secondments from big industry - Recruitments from Big Pharma - Mentorship - Big industry board member - Big Pharma founder of a BVH company - Formal events held by big industry - Advice from Big Industry	- Perception that BVH companies have gotten new competence from BVH big industry interactions that has been valuable for their development
	Entrepreneurial outflow	- Secondments from BVH companies - Recruitments from BVH companies - Formal events held by BVH companies - Advice from BVH company to Big Pharma	- Big Pharma employees have gotten experience outside ordinary Big Pharma competence - Big Pharma employees feel that they have gotten entrepreneurial knowledge from companies in the hub - Big Pharma employees have gotten knowledge that could be used in their daily work activities

Table 6.8: Examples of hard and soft metrics to use in order to measure the proposed KPIs within the categories; community and collaboration.

Categories	KPIs	Metrics hard	Metrics soft
Community	Maturity		- Perception that companies have aligned knowledge - Perception that companies have an aligned vision with BVH/ the ecosystem - Perception that companies have aligned activities
	Culture		- Perception that the hub has contributed to the culture at the Big Pharma site - Perception of a dare to share degree - Perception that BVH promotes a collaborative culture
	Engagement	Number of informal events Number of unique participants at events - Big Pharma company - BVH Companies	- Perception of knowing who to contact at the Big Pharma company - Perception of having weekly contact/talks about job related things with the companies in the hub - Talks between cross-sector companies - Weekly contact/talks with Big Pharma employees
Collaboration	Collaboration	No. of collaborations - Big Pharma and companies - Between companies - Cross-sector companies - Companies and big industry - Academic collaboration	Success from collaboration - Shared publication - Companies created from a collaboration - Products from collaboration - Shared Patents - Financing for a new collaboration - Perception that they would not have had a specific collaboration if it would not have been because of the hub

7

Conclusion

In this chapter, the conclusions from the study will be presented.

This study aimed to understand how the outputs of catalyzation of innovation can be measured in a context like the BioVentureHub. To reach this aim, the main research question was formulated at the beginning of this thesis as:

Which measurement variables are effective to use when measuring value capture in a context like the BioVentureHub?

As the result, measurement variables have been presented in the form of six categories to be measured within, 15 Key Performance Indicators, see Table 6.4 and a wide set of soft and hard metrics as a complement. This result was reached by combining theories from performance measurement, innovation, and collaboration, with the knowledge gained from this case study. The authors decided to construct metrics that are both including the stakeholder perspective from the Performance Prism framework, while at the same time maintaining a strategic focus which is the thinking behind the Balanced Scorecard. Even if the focus of the study has been on soft values, the authors believe that the output of catalyzation of innovation can only be measured by combining hard quantitative values with soft qualitative ones, that includes feelings and perceptions in a much wider range. Furthermore, the authors agree with Kaplan and Norton that there must exist financial and tangible measures as a complement to non-financial and intangible ones, and therefore, the final construction includes a combination of both. The reason why the authors find the combination as important they do is because they think this will give an honest picture and complete picture of an organization, in ways neither hard and financial nor soft and non-financial measures can do without each other.

8

Future Research

In this chapter suggested future research will be presented based on the findings and discussions from the study.

This study adds on to the previous literature that has been written on the context. The study contributes to the understanding of what value that is being captured by the stakeholders of the BioVentureHub, in other words, the output generated from an innovation initiative like this. This study also resulted in what measurement variables to use in the specific context of the BVH. However, there is still research that needs to be done and some suggestions will be presented below.

Due to the time limitations, the authors did not have as much time as wanted in order to find the most appropriate metrics for each KPI that was presented. To find the most appropriate ones for every organization, further research needs to be done.

The authors presented a set of measurement variables to measure the value that has been captured in the BVH context, but there was no time for implementing and adjusting the framework. In the next step, the specifics on how to measure each KPI need to be determined and if a weighing system should be incorporated or not. To make sure that the framework works in similar contexts, it needs to be implemented and tested in other environments where a Big Industry actor collaborates with SMEs.

As an ending of this research, appropriate measurement variables for this specific context have been designed. Interesting research to conduct by the help of the KPIs would be to understand and compare if BVH is creating value for the companies situated in the hub in ways that companies either situated in another environment or no environment at all is missing.

Lastly, one interesting follow-up research would be to use this framework in several contexts similar to BVH, including other hubs and business accelerators, in order to compare them to each other. By understanding the similarities and differences of each environment, there will be a possibility to learn from each other to capture as much value as possible in society.

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9

Appendix

9.1 Interviewee Overview

This Appendix presents an overview of all the interviewees. All interviews were held for approximately 1 hour. In order for the interviewees to be anonymous, the authors have chosen to exclude names, company names, and roles in the company. For the overview, see Table 9.1.

Table 9.1: An anonymous list of the interviewees

Investors	AstraZeneca	Companies
VGR	Person 1 (BVH)	A - Drug
BRG	Person 2 (BVH)	B - Drug
BRG	Person 3	C - Medtech
Vectura	Person 4 (BVH)	D - Medtech
Vinnoba	Person 5	E - Drug
Vinnova	Person 6	F - Drug
	Person 7	G - Drug
	Person 8	H - Medtech
		I - Service
		J - Medtech

9.2 Interview Templates

Below are the templates used when interviewing the different stakeholder groups; investors, AstraZeneca, and SMEs. In the report, Chapter 4 Table 4.2, the aim of each topic is described.

9.2.1 Investors

The interview template for the investors also referred to as the external stakeholders in the report. The interviews were adjusted slightly depending on the interviewee in order to receive their unique perspective.

1. Introduction

- Introduction to our project
- Tell us about yourself and your role at your organisation
 - What is your connection to the BVH?
- What is the purpose with BVH according to you?

2. Strategy for every stakeholder

- What wants and needs do you at your organization have for the development of Gothenburg within the life science area?
- What kind of needs do your organization have that are not fulfilled, and where does your organization need help?
 - What changes does the city/region/country face?
 - Discuss the life science strategy.
- What is needed to fulfill your wants and needs?

3. The purpose of being a stakeholder

- Why did your organization invest in the BVH?
 - What challenges did your organization have that you wanted to solve when joining BVH?
 - What were your expectations with BVH?
 - How is BVH a part of your strategy?
 - Why do you keep investing / why are you not investing anymore?

4. What value has been created and captured

- Until now, have BVH lived up to your expectations?
 - If yes, could you tell us more specifically how?
 - If no, what is lacking?
- How has the hub contributed to Sweden/the region/Gothenburg?
- What is it that is creating value with BVH from your perspective?
- How are you communicating BVH in your everyday job?

5. Innovation capabilities

- How have you as an organization contributed to the hub/AZ/other companies/Sweden?
- Sweden is seen as one of the world's most innovative countries, could you reflect upon why you think it is and how it could continue as one?
- What inputs and processes are needed in order to create an innovative region?
 - How is the hub a part of these processes? Why so?

- What processes need to be further developed in the hub?

6. BVH in the future

- When and in what state would you perceive BVH as a success if you see it from a futuristic perspective?
 - In 5 years?
- If anything was possible from a life science innovation perspective in Sweden/the region/Göteborg?
 - How could BVH contribute to reaching that goal?
- Would you say that the goal with BVH is the same as at the beginning of the interview?

9.2.2 AstraZeneca

The interview template used when interviewing employees at the Big Pharma AstraZeneca.

1. Introduction

- Introduction to our project
- Tell us about yourself and your role at AstraZeneca
- What is the purpose of BVH according to you?

2. Strategy for every stakeholder

- What current challenges/opportunities can be found in the Pharma industry and is facing AstraZeneca?
- What wants and needs do you at AstraZeneca have in order to manage these challenges?
- What is needed to fulfill your wants and needs? What measures/actions?
- How do those actions fit into AstraZeneca's strategy? (Scientific leadership/growth/-great place to work)

3. The purpose of being a stakeholder

- What is the reasoning behind the creation of a bio hub in Sweden?
 - What challenges would you like to solve using the hub?
 - Is the reasoning behind BVH the same as in the beginning?
 - What are the reasons for continuing with the hub?

4. What value has been created and captured

- Up until now, has BVH lived up to your ideas and expectations?
 - How has the hub contributed to AZ, from your perspective?
- What is it that is creating value with BVH?

5. Innovation capabilities

- Can you reflect on the culture and the soft values that exist?
 - Between the companies, and between the companies and AZ?
- How have you as an organization contributed to other companies/Sweden/the hub?
- What processes need to be developed to create/increase interactions between the hub and AZ?
 - How is BVH communicated internally?

6. BVH in the future

- When and in what state would you perceive BVH as a success if you see it from a futuristic perspective?
 - In 5 years?
- If anything was possible from a growth perspective within big pharma - what would that be?
 - How could BVH contribute to reaching that goal?
- Would you say that the goal with BVH is the same as in the beginning?

9.2.3 SMEs

Interview template used when interviewing companies that currently is or has been a part of the BioVentureHub.

1. Introduction

- Introduction to our project
- Tell us about yourself and your role at your company
 - Introduce your company: Research, service, or product development? Where in the value chain are you?
- What is the purpose of BVH according to you as a company?

2. Strategy for every stakeholder

- What wants and needs do you as a company have to increase growth and business development?
- What kind of needs do you have that are not fulfilled, and where do you need help?
 - What changes are your company facing? Future needs?
- What needs to be done to fulfill those needs?

3. The purpose of being a stakeholder

- Why did you apply for being a part of the BVH? Any specific challenges?
 - What were your expectations?
 - Do you have any ideas on how the BVH could contribute to your strategy/-growth/development?
- Is your reason for being a part of the hub the same as when you applied?
 - What other alternatives did you have, except the BVH?
- What are the reasons for staying in the BVH?

4. What value has been created and captured

- Until now, have BVH lived up to your expectations?
 - If yes, could you tell us more specifically how?
 - If no, what is lacking?
- What has the hub contributed to your company? (Competence, equipment, permissions)
 - What challenges have you faced during your time in the hub? How were they solved?
- If another hub would offer free office space for a year, would you stay in the hub or change?

- If you could be a part of an environment where the support was focused on financing but you wouldn't have access to other AZ/BVH-companies competencies and lab, would you rather have chosen that type of environment?
- If the possibility of being at the AZ site would still exist, but without access to other hub companies would the environment be equally attractive?

5. Innovation capabilities

- Could you reflect a little bit on the culture between your company and AstraZeneca, your company, and the other hub companies?
- How have you as a company contributed to the hub/AstraZeneca/other companies/Sweden?
 - What responsibility do you see from the company side that you have for building this environment?

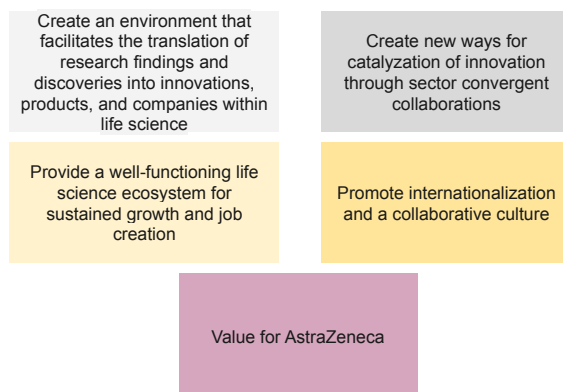
6. BVH in the future

- When and in what state would you perceive BVH as a success if you see it from a futuristic perspective?
 - In 5 years?
- If anything was possible from a growth company perspective?
 - How could BVH contribute to reaching that goal?
- Would you say that the goal with BVH is the same as in the beginning?

9.3 KPI Workshop

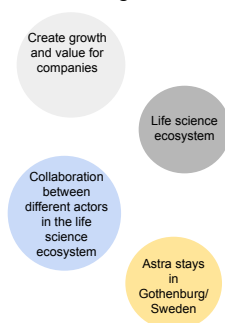
The following pictures show the outline of the validation workshop that was held with the BioVentureHub team.

The goal with the BioVentureHub

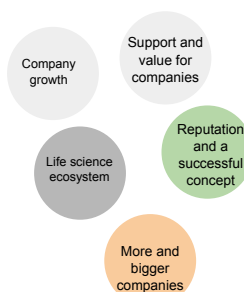


Part 1: Investors

What are the four most important goals with BVH according to the investors?



What does the investors think are the five most important things that BVH has and should deliver?

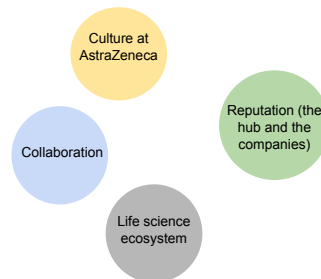


Part 2: AstraZeneca

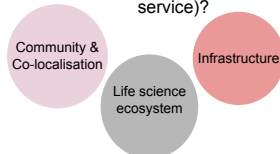
What are the five most important goals with BVH according to AstraZeneca?



What does AstraZeneca think are the four most important things that BVH has and should deliver?

**Part 3: Companies**

What are the three most important goals with BVH the product developing companies (medtech, digital health and service)?



What does the product developing companies think are the four most important things that BVH has and should deliver?



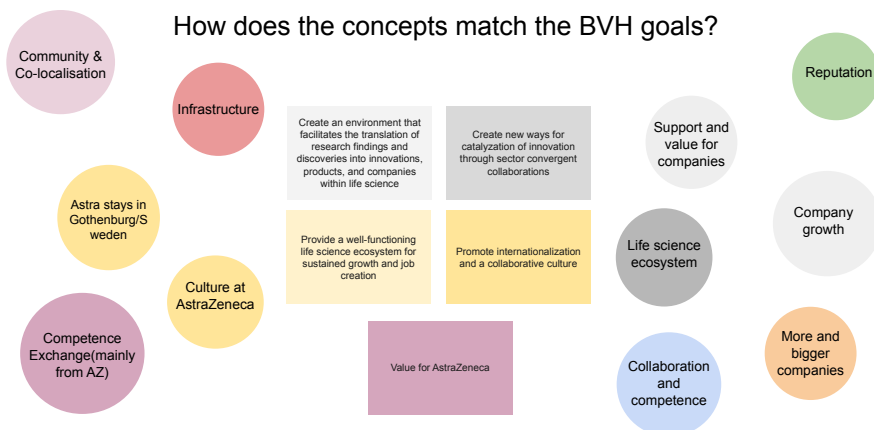
What are the two most important goals with BVH according to the Pharma companies?



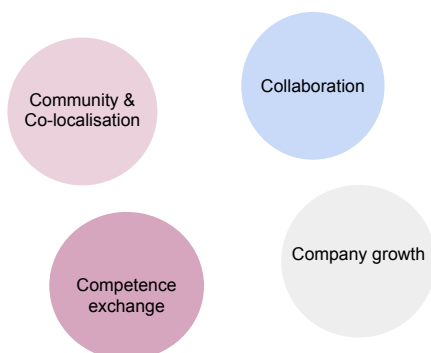
What does the Pharma companies think are the three most important things that BVH has and should deliver?

**Part 4: Merge**

How does the concepts match the BVH goals?



How can we create more value around these concepts?



9.4 KPI Scorecard

Appendix 9.4 presents in the following figures an example of how the categories with the corresponding KPIs and metrics can be visualized. The numbers shown in each figure representing the metrics are fictional and do not represent the current situation at the BioVentureHub.



4. Collaboration

Collaboration

Number of Collaborations



90%

Of collaboration partners perceive that the collaboration would not have happened without the hub

Success from Collaborations



5. Community

Maturity



Culture



Engagement



6. Attractiveness

Reputation BioVentureHub



Number of Applications



Reputation Companies



Reputation AstraZeneca



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