



Degree Program in Management

Course of Managerial Decision Making

Connecting with and Supporting Grassroots
Innovators
A comparative case study

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Abstract

This paper examined how innovation hubs are identifying and connecting with grassroots innovators, and how they can support grassroots innovators. Grassroots innovators are typically entrepreneurs from poor communities. Supporting these innovators can increase sustainable development in poor communities, and how institutions can do this is under-researched. To answer the research questions literature on grassroots innovation, innovation hubs, and challenges faced by grassroots innovators was reviewed, and nine semi-structured interviews were conducted with managers and innovators from two innovation hubs.

Analysis of the transcripts demonstrated that innovation hubs' roles and goals are important deciders on how they identify and select innovators. Furthermore, many important factors to consider when supporting innovators were found. It is concluded that innovation hubs that identify problems and drive innovations can use more active approaches to find innovators (e.g., innovation contests or the lead user method), while innovation hubs that are more passive and let innovators identify problems can use open calls for applications to their support programs. Furthermore, factors like funding, infrastructure, networks, training, and the structure of the program itself are important to consider when supporting innovators. And, if innovation hubs want to provide broader support to grassroots innovation, they should open their infrastructure and education programs to the public, allow any kind of project to join their support programs, provide support and infrastructure in rural areas, and create networks of entrepreneurs in grassroots communities.

Keywords: Grassroot innovation, innovation hubs, incubation, acceleration, supporting innovators, developing innovation systems.

Practical recommendations

These are the recommendations that managers of innovation hubs can learn from regarding support of incubatees and broader grassroots innovation. Which recommendations are appropriate depends partly on the role of the innovation hub. Innovation hubs can be drivers of innovation that identify problems/gaps and search for solutions, or they can be supporters of innovators (i.e., not identifying problems/gaps on their own). Innovation hubs should consider what kind of role they want to have before applying these recommendations. Find the short-form recommendations below, further explanations of each recommendation can be found in section 6.1.

Identifying & Connecting: How university-embedded innovation hubs should identify and connect with innovators depends on the hubs' goals and roles.

- Use easy-to-apply group applications with critical questions. Or use a mixed approach with innovation contests, application calls, lead user method, and networking depending on the situation.
- Use a staged selection process with trainings, external judges, and clear criteria sent out before selection. Or identify a problem and then discuss criteria individually with different innovators.
- Use criteria suitable for the field and the type of innovator wanted. Good idea to include criteria for passion and commitment.
- If university-embedded innovation hubs want to connect with grassroots innovators on a broader scale, they should accept projects based on social problems, and innovators from outside the university, help innovators from rural communities to apply, and help them where they live.

Support: How university-embedded innovation hubs can support incubatees depends on the role they want to have and on their capabilities. Below are some recommendations for how they should do it.

- Cover the inception (problem validation), protective niche (prototyping), and open market phases (scaling) in the support program. Alternatively, the open market phase can be supported by a collaborating partner hub instead.
- Fund incubatees in a way that aligns with their needs. Establish partnerships and networks that can help with funding. Partnerships and networks are particularly important if the hub has limited capability to fund scaling.
- Provide the infrastructure the incubatees need to develop their prototypes (e.g., with a makerspace). But consider carefully what capabilities it should have, where it should be located, and how much incubatees will use it.
- Provide training in technical skills, soft skills, business/managerial skills, and industry knowledge to incubatees. Also, provide support with complex tasks that require too much training to learn.
- Provide useful networks for incubatees. Networks should be created to connect incubatees with stakeholders, partners, industry, and financiers. Also, consider providing recommendation letters and visibility to build trust for the incubatees.
- If university-embedded innovation hubs want to support grassroots innovation on a broader scale they should consider opening their infrastructure (e.g., makerspace) and education to the public, locate infrastructure where the grassroots live and create local networks for the grassroots to connect. However, providing help with intellectual property applications is probably less important.

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1 Introduction

Innovation is a powerful engine of change; it can be used to transform ideas into new products and services and improve people's lives. But ideas are fragile, as Charles Brower (an advertising executive) said "*A new idea is delicate. It can be killed by a sneer or a yawn; it can be stabbed to death by a quip and worried to death by a frown on the right person's brow.*". Ideas are fragile and developing innovations is challenging, which is why more than 80 per cent of new products and ventures fail in the marketplace (Emmer, 2018; Howarth, 2022). However, successful innovations can harm people, for example by accidentally systems of structural marginalisation. Innovation needs to be guided in the right direction as well as be supported for it to bring positive development. Innovation systems designed appropriately can assist in this goal.

Most nations with more advanced economies are benefitting from more advanced and efficient innovation systems while developing countries are struggling to develop their innovation systems (Yongabo, 2021). This is because developing countries have had less time to develop their innovation systems and it is a struggle to catch up because innovation systems cannot simply be copied from one nation and be replicated in another (Yongabo, 2021). The local political, cultural, and social contexts (including economic structures, institutional capacity, and resource endowment) need to be considered when innovation systems are built.

Innovation systems are complex networks of human and non-human actors that help ideas diffuse into real products, services, and innovative organizational forms (i.e., they bridge the gap between knowledge production and the use of knowledge). Edquist (1997) defines innovation systems as: "*All important economic, social, political, organizational, institutional and other factors that influence the development, diffusion and use of innovations.*" (p. 14). Innovation systems can be interesting to analyse in different contexts, therefore there are multiple concepts regarding innovation systems. There are, for example, geographical (national, regional, local, and global) and technological (technological and sectoral) innovation systems.

There are many different actors in innovation systems, and in this project, innovation hubs will be analysed. The most famous innovation hub is probably Silicon Valley in California, USA. In this study, innovation hubs in Africa will be analysed, and there are many innovation hubs in developing countries and Africa as well. For example, Ilab Africa in Kenya, Launchlab in South Africa, Bioinnovate in Kenya, iSpace in Ghana, and Nigeria Climate Innovation Centre in Nigeria. A quick description of innovation hubs are regions where innovation is supported and more frequent, a more precise description is given in section 2.2.

There are multiple concepts of innovation, and some relate to the innovation created by poorer entrepreneurs or innovations targeted at poorer communities. As more developed markets start to become more saturated with firms and competition, an incentive to target developing markets is growing for multinational companies. The developing countries have large populations, although the average consumer is poorer and the market capitalisation in a sense becomes smaller because of that. Even still the market capitalisation is significantly large to be attractive for international companies. International companies have tried to make innovations for the poor or for the base-of-the-pyramid consumers. The base-of-the-pyramid can be defined as a “*poor or low-income population with limited capacities to become producers or consumers in the globalized marketplace*” (Bagchi-Sen et al., 2015, p. 269). But innovating for the poor or for markets that might be missing important features (e.g., distribution networks) can be challenging. To resolve these issues companies can work with new partners like non-governmental organisations (NGOs) or directly with the poor, try new business models, and try new pricing models. There are a few approaches to innovating for base-of-the-pyramid consumers. One tried by multinational companies is called pro-poor innovation. This kind of innovation typically revolves around making products as cheap as possible by cutting features of the companies’ existing products or making smaller packages (Karnani, 2006). But this approach doesn’t involve the poor in development or production, and the success of this approach is questionable (Bagchi-Sen et al., 2015), as the base-of-the-pyramid don’t want to buy a lot of junk products but rather want a few carefully selected good-quality products (Bagchi-Sen et al., 2015). Another approach to innovating for the poor is inclusive or frugal innovation. This approach has a more complex goal compared to pro-poor innovation, which is to actually meet the demand of the base-of-the-pyramid, by creating high-quality and high-performance products and selling them at affordable prices (Bagchi-Sen et al., 2015). Users of this approach to innovation also work with new business models and partnerships (with NGOs

and the poor) to create innovations. Another approach to innovating for the poor or maybe rather a concept of innovation is grassroots innovation, which is the interest of this study. In this kind of innovation, it is the poor or people from the base-of-the-pyramid that create the innovations. These innovations often solve local self-experienced problems and use locally available resources, this makes the innovations appropriate for the context they are in. However, grassroots innovation projects are typically small-scale and large-scale adaption (or diffusion) can be difficult (OECD, 2015; Seyfang & Smith, 2007). Grassroots entrepreneurs and multinational companies can collaborate. Such collaborations can give the companies more locally appropriate products and give the entrepreneur access to a larger market (Bagchi-Sen et al., 2015). However, for local entrepreneurs and multinational companies to come in contact is difficult, but it is something innovation hubs can help with. Boosting and supporting grassroots innovation can be an approach to create effective innovation for the base-of-the-pyramid (poorer) consumers, while also potentially alleviating poverty and providing the poor solutions to their unsolved problems.

There isn't any widely used definition of grassroots innovation, but it can be simplified as innovation by the poor for the poor. It is often carried out by entrepreneurs or groups from marginalised (or base-of-the-pyramid) communities that try to solve local self-experienced problems outside the regular innovation system with limited resources (more explanations and definitions of grassroots innovation are given in section 2.1). The entrepreneurs and groups are called grassroots innovators/actors/groups/communities and feel the need to do this as their problems are not being solved by the regular innovation system. The working definition of marginalised communities for this thesis is poor communities where people don't get what they need from the market.

Innovation is difficult, and these grassroots innovators face additional challenges in their innovation efforts. Different challenges to grassroots innovation projects have been identified including intrinsic challenges like finding resources, funding, keeping volunteers, and insufficient managerial skills (Seyfang & Smith, 2007; Hossain, 2018; Jones et al., 2019; Bernstein et al., 2021), diffusion challenges (i.e., taking innovations from a protective niche to the open market; Seyfang & Smith, 2007; Dana et al., 2021), extrinsic challenges (i.e., geographical rootedness, context specificity, ideological commitment; Hossain, 2018), social-

cultural-commercial trilemma (Jones et al., 2019), fitting into the local situation/system (Smith et al., 2014), lack of community involvement (Dana et al., 2021), and more.

Actors from the traditional innovation system (like innovation hubs) can support grassroots actors in overcoming these challenges. Independent and university-embedded innovation hubs can help grassroots innovators in their efforts, but how the hubs can do this is understudied. Some hubs focus on supporting grassroots actors (e.g., 2Scale and UNDP Accelerator Labs), but most of these are publicly funded independent innovation hubs.

This study aims to analyse how different innovation hubs support grassroots innovators through their support programs (more details on support programs in section 2.2) and what university-embedded innovation hubs (which are new in the context of developing economies and differently positioned) can learn from them. As the two kinds of hubs are different university-embedded innovation hubs will have to choose those practices that fit their structure and context. Due to the context-specificity of innovation systems most likely hubs will need to consider the context (e.g., the social, cultural, and political contexts) when designing support practices. To analyse and understand what the best practices are and which of them university-embedded innovation hubs can use a comparative case of one independent and one university-embedded innovation hub will be made and general recommendations for university-embedded innovation hubs will be made. The benefits of increased support of grassroots projects include the involvement of the people who experience the problems, which have the best insight. It can help lift people out of poverty by creating new supply chains and jobs. Grassroots projects are perceived to have a higher chance of success (Cherunya & Ahlborg, 2020), as the community is more involved in the production and diffusion of innovations. These three benefits probably fit quite nicely with many university-embedded innovation hubs' aims to support local innovation systems and contribute to society and will likely motivate them to consider what they can learn from grassroots supporting practices.

The remaining sections of this study are structured in the following way: The second section is the literature review which goes through important concepts like grassroots innovation and innovation hubs, delves deeper into challenges experienced by grassroots innovators, and develops the research questions. The third section regards methods and states the research

strategy, research design, the two case organisations, collection of data, methods of analysis, and the sample of interviews. The fourth section presents the findings of the interviews. The fifth section summarises the findings of the interviews and discusses the findings through the lens of the reviewed literature. The last section summarises the findings of the article, provides recommendations for innovation hubs, discusses implications for theory, presents limitations to the study, and presents avenues for future research.

2 Literature Review

In this section, the literature will be reviewed. What grassroots innovation is and how it differs from innovation will be discussed. What innovation hubs, incubators, and incubators are, and how they contribute to innovation will be discussed. Challenges to grassroots are reviewed. Lastly, the research questions are presented.

2.1 Innovation and Grassroots Innovation

Innovation is a multifaceted concept, and as mentioned in the introduction it can be powerful. Often seen as a positive force, but its negative effects are less often recognised. Societal challenges can be created by innovation, for example, loss of livelihoods, economic and social inequalities, war and oppression, and environmental degradation (Chapman, 2007, as cited by Smith & Stirling, 2018). But the positive potential of innovation should not be neglected, done in the right way innovation can lift people out of poverty, be inclusive to marginalised people, and bring sustainable development. World Commission on Environment and Development gave a broadly used definition of sustainable development in its 1987 so-called Brundtland report: “*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*” (p. 43). Hekkert et al. (2007) define innovation as “*the search for new ways of using software (e.g., knowledge, policy incentives, behaviour change strategies), hardware (e.g., technical devices), and/or orgware (e.g., organizational, business models, financial instruments) in such a way that the speed of change towards solving societal challenges is accelerated*”. Their definition emphasizes the development of sustainable innovation that helps solve societal challenges, but it doesn't specify two fundamental factors of innovation, implementation, and development. Innovation means that the new idea should gain some level of success in adoption and that a new product/service/orgware is developed or that an old product/service/orgware is put into a new market (OECD, 1997). Note well that innovation entails developing an idea, developing a new product/service, and reaching market success. Goffin and Mitchell (2017) identify five dimensions of innovation: New Products, Process Innovation (Manufacturing), New Services, Business Processes, and New Business Models. Furthermore, Goffin and Mitchell (2017) pose three degrees of innovation, Incremental, Breakthrough, and Radical. Incremental innovation is the most common and entails small improvements which are easier to develop, but that can bring large improvements with continued development over time. Radical innovations are rare

and more difficult to develop, but they transform or create new markets (e.g., the first widely sold car). Breakthrough innovations lie between incremental and radical; they are more difficult to develop than incremental but are not as transformative as radical. However, there are also different concepts of innovation, one such is Grassroots Innovation.

Grassroots innovation can be called innovation for the poor by the poor, and it aims to solve local problems. It can be the application and marketing of elsewhere existing innovations targeting local under-served consumers and often the innovations are incremental (OECD, 2015). The UNDP Accelerator Labs and the London School of Economics and Political Science define grassroots innovations as "*indigenous solutions, created by actors in civil society and supported by limited resources, which aim to address local situations and often achieve sustainable development.*" (Rungachavalnont, 2021). Grassroots innovation essentially means that people solve their self-experienced problems, and this can be done alone or with help from institutions. The OECD (2015) highlight that they often occur in the informal economy and although the poor are involved in grassroots innovation, they can be involved to varying degrees. They can have smaller roles (e.g., retailer of a new product) supported by actors in the innovation system, like universities, NGOs, or private firms, or they can have bigger roles (e.g., innovator or joint producer). Grassroots innovations emphasise the empowerment of low-income communities and being inclusive to marginalised and low-income communities (Heeks et al., 2013). Dana et al. (2021) define grassroots innovations as innovations developed to address local-specific opportunities and challenges that can have the potential "*to be turned into entrepreneurial ventures, and generate a livelihood for the innovator as well as others in the community*" (Guttikonda, 2016, p. 6, as cited by Dana et al., 2021). The main differences between grassroots innovation and classical innovation are that grassroots innovation: involves the poor or marginalised, solves local self-experienced problems (e.g., lack of livelihood or education), is done outside the regular innovation system, and is often done with very limited resources.

Cherunya and Ahlborg (2020) found that hubs across Africa design many innovations and business models that target marginalised and low-income communities, these communities are however seldom involved in the development. This could be because they lack the time and resources to get involved and need to work. Hence, their knowledge and viewpoints relevant

to these innovations and business models are neglected, and solutions will be sub-optimal for the problems that these marginalised communities face and other problems might be overlooked. The authors identified this issue by interviewing representatives from forty-six hubs and relevant organisations (e.g., hub networks) across Africa. Thirty of the examined hubs and organisations were East African and nine were Rwandan. Furthermore, Cherunya and Ahlborg (2020) state that enabling co-innovation with these communities is important to consider when developing an impactful hub. The lack of involvement of marginalised and low-income communities in development processes is likely common in Rwanda as a large part of the population is living below the poverty line, 55% in 2017 according to the World Bank (2022b). The percentage of Rwandans living in poverty has however probably decreased since 2017 as the Rwandan economy has grown. Furthermore, this statistic doesn't account for the informal part of the economy, which is about 31,3% in Rwanda (World Economics, 2022), hence the statistic will indicate that more people live in poverty than is true.

Cherunya and Ahlborg (2020) state that there is a need for developing local solutions to local problems across Africa, and this can be achieved by hubs by involving low-income and marginalised communities in the innovation process. UNDP Accelerator Labs (2020) state three ways innovation can be undertaken. One way to do that is to co-innovate with grassroots innovators. Another is to gather knowledge and viewpoints from them to inform designer-led innovation. A third is to support grassroots innovators/groups in their innovation activities. The involvement of grassroots actors in these three ways should be increased as they have the best insight into their experienced problems, involvement can help lift people out of poverty by creating jobs, and it is perceived to have higher chances of success (Cherunya & Ahlborg, 2020). Supporting grassroots innovators to innovate on their own or co-innovating with institutions helps solve the issues that stem from the lack of involvement of these groups in innovation and will help them to solve their local problems while also bringing other benefits.

To summarise, there is a need to solve local problems in developing economies, grassroots innovation has the potential to create the needed local solutions, and grassroots innovations are different from regular innovation in a few keyways. There is no widely used definition of grassroots innovation, but the literature discusses a few factors that distinguish grassroots innovation from regular innovation. These are the involvement of poor or marginalised people

(to varying degrees), sparse funding, innovation created outside the regular innovation system (often in the informal economy) and solving local often self-experienced problems.

2.2 Innovation Hubs, Accelerators, and Incubators

Innovation hubs, incubators, and accelerators play important roles in innovation systems. They all support ventures in their different stages. Cherunya and Ahlborg define innovation hubs as the following:

social communities and workspaces that together function as safe spaces for impactful ideas to be identified and nurtured in the early stages to withstand open market pressures. The nurturing and protection are provided to innovators and entrepreneurs through access to subject-matter expertise on technical and market trends and access to practical tools and resources. More significantly, hubs provide the venture owners with a safe space to fail. (2020, p. 7)

Innovation hubs are important due to the critical role they play in innovation systems. Hubs create and facilitate networks, support entrepreneurs, and protect ventures from market forces. They have an important role in creating the innovation system. Since the 1950s the concept of innovation hubs has gained traction and has emerged globally. Innovation hubs and efficient innovation systems can potentially boost the growth of a nation by helping innovation to flourish. As well as boosting growth and innovation they might also help solve challenges to sustainable development (United Nations, 2019), three things that are needed in developing economies. In the historical African context, innovation has mainly been driven by the technology transfer from the West, but in later decades there is a growing movement of local innovation (United Nations, 2019).

An interesting topic to research is how innovation hubs can co-innovate with, support grassroots innovation in, and gain insights from these marginalised communities in the context of developing economies. Innovative ways of connecting with these communities and giving them environments to engage in innovation must be found by hubs to foster co-innovation (Cherunya & Ahlborg, 2020). The authors state that hubs tend to have a “*sophisticated*” appearance that might not be inviting to people from marginalised communities. Many innovation hubs tend to have very similar appearances all around the world and even if they are in different technical fields and these features might be what gives the “*sophisticated*”

appearance. Some examples include that, they tend to have coffee bars, bean bags, meeting rooms, artwork, large desks, and brick walls (Toivonen & Friederici, 2015). Furthermore, these communities might not have the possibility to go to the hub. If these communities can't come to the innovation hubs, then one option is for the hubs to go to the communities and work with them there. Toivonen and Friederici (2015) identify a few key characteristics that describe most hubs: 1. Hubs create cooperative communities with innovators at their core. 2. Hubs draw individuals with a variety of knowledge. 3. Hubs encourage innovation and teamwork in both physical and virtual environments. The spaces are designed to facilitate face-to-face meetings and spontaneous meetings. 4. Hubs localize the international entrepreneurial culture.

Innovation hubs can be divided into two categories, university-embedded and independent. In a 2019 study, Afrilabs and Briter-Bridges identified 643 active innovation hubs across Africa. They surveyed 92 hubs about their structure, business models, funding, and more. Most of these were based in private firms and NGOs, something like 95%. A small percentage were based in academic institutions 2% (the specific numbers weren't presented). This suggests that there is room for more university-embedded innovation hubs in Africa, and they will likely come with time. For this study, independent hubs are defined as non-campus hubs while university-embedded hubs are part of a private or public university's campus. This definition is copied from Cherunya and Ahlborg (2020) who use it, although they don't state it explicitly.

This distinction between independent and university-embedded hubs is noteworthy as they perform similar tasks but have different goals and motivations. University-embedded innovation hubs are positioned differently from independent innovation hubs (Cherunya & Ahlborg, 2020), and might be run by public institutions to improve the efficiency of innovation systems. University-embedded innovation hubs might be run on mandate by the public sector, on government funding, and have different goals and orientations compared to independent innovation hubs. For example, university-embedded innovation hubs have a strong connection with academia and students, one goal university-embedded innovation hubs might have, is to let students practice their creative problem-solving skills by designing and testing ideas for products and ventures. While independent hubs are enterprises often motivated by profits that only take on projects and entrepreneurs the hubs think can make money. Independent innovation hubs usually take a fee to house and support entrepreneurs at their offices. The fees

can be sizable, which means that poorer entrepreneurs might not be able to afford the independent hubs' services. There are, however, independent innovation hubs that focus on poorer entrepreneurs. One such example is 2Scale which is a publicly funded enterprise that focuses on developing inclusive agribusinesses across Africa. How university-embedded innovation hubs can reach, include, and support poorer entrepreneurs is under-researched. It would be interesting to study the practices of an inclusive innovation hub like 2Scale (Cherunya & Ahlborg, 2020), and analyse how university-embedded hubs can apply it in their contexts.

Two activities innovation hubs can support ventures with are incubation and acceleration. Incubation regards the very early stages of a venture, like coming up with an idea, making sure it solves a real problem, making a prototype, testing it, and improving the prototype until the product is completed. Acceleration comes after the product is ready for market, although there likely still is room for improvement of the product. Acceleration entails building a business out of the idea (also called scaling), ramping up production to meet demand on a wider market and start selling the innovation. There are organisations focused on these two support activities and they are called incubators and accelerators. An organisation can also be both incubator and accelerator in one. These kinds of organisations can be part of innovation hubs and can be university-embedded or independent. Typically, they provide programs of incubation or acceleration to support selected ventures. In doing that these organisations support innovation in the system and if they chose to select (or accept) projects coming from the grassroots level of society for their programs they are also contributing to grassroots innovation. The programs of these organisations will be the focus of analysis in this study and are the way chosen to understand the contribution of innovation hubs to grassroots innovation.

Typically, the applicants to these programs are entrepreneurs, which are people working with starting ventures. But they don't have to be single entrepreneurs, they can be groups of entrepreneurs or young startups. In this paper, they will be called innovators. When innovators are selected for a program of incubation, they can be called incubatees. In this paper, both innovators supported by programs of incubation and/or acceleration will be called incubatees.

Innovation hubs, incubators, and accelerators are enablers of innovation and entrepreneurship through their support programs. In their programs, they can support innovators in their

development processes by providing incubatees with what they need to develop their innovations. For example, the skills, funding, infrastructure, and networks, among other things required. The skills can be training in business skills or prototyping. Infrastructure can be workshops and tools. Funding can be to develop the product or to start the business. Networks can be connections with stakeholders or partners. But these institutions can also become enablers of grassroots innovation with some considerations. For example, if they are willing to accept innovators from the grassroots level of society into their programs and make considerations for their challenges (like limited capital and education) in the support programs. This is especially needed in developing countries where more people are living in poverty. Some hubs focus on inclusive and grassroots innovation and work with supporting grassroots innovators. Two examples of such innovation hubs are UNDP Accelerator Labs and 2Scale.

The above-mentioned kinds of support institutions can use different strategies to find suitable innovators to include in their programs, for example, *open applications*, *innovation contests*, and the *lead user method*. Open application means making a call for innovators to apply to join the incubation program, usually, the call is advertised in some way (e.g., on official website and social media). Using open applications is a more passive approach and is good if the institution wants many different innovation projects. There are also more active approaches, for example, the lead user method and innovation contests. Both these two strategies require that the organisation has identified a problem to be solved. Actively searching for existing innovations elsewhere that could solve the identified problem, is an approach that can be called the lead user method (Goeldner et al., 2017). Innovations contests entail identifying a problem and making a call for innovations from innovators that can solve that specific problem. Innovation contests and the lead user method are appropriate depending on the goal of the organisation looking for an innovation (Goeldner et al., 2017). Contests are better for quickly and cheaply generating many ideas, while the lead user method is better for generating ideas that already have demonstrated feasibility (Goeldner et al., 2017). Relying on the two latter strategies entails having a more active role as a driver of innovation, compared to letting the applicants bring the ideas. Being active or passive should be a careful consideration that institutions make.

2.3 Challenges to Grassroots Innovation

In this subsection, the findings of different authors regarding challenges to grassroots innovation projects/movements/initiatives/innovators are reviewed.

2.3.1 Intrinsic and Diffusion Challenges

Many challenges can hamper the success of grassroots innovation projects, Seyfang and Smith (2007) studied grassroots community groups as drivers of innovation and sustainable development to identify opportunities and challenges faced by grassroots initiatives. These communities aim to solve their own needs, hence, solving problems that haven't been sufficiently solved by top-down innovation (i.e., solved by companies, institutions, or governments). This is an important contribution from grassroots innovation to sustainable development. The challenges can, however, be overpowering for grassroots innovation projects, which is suggested by the statistic that project initiatives only spend 10% of their time on developing the activities and 90% of surviving the challenges (Church, 2005 and Wakeman, 2005, as cited by Seyfang & Smith, 2007). The authors state two categories of challenges, intrinsic challenges, and diffusion challenges. Although Seyfang and Smith (2007) analyse community groups their findings are relevant to a broader view of grassroots projects that include single grassroots innovator projects, as most of the same challenges apply to them.

Intrinsic challenges relate to problems arising from inside the grassroots initiative. These are issues regarding the initiative's resources, the initiative's fit into funding schemes, technology, and more (Seyfang & Smith, 2007): 1) Gathering all the necessary resources to achieve success is difficult, especially for people without business training, as they might not know all the resources they need. Initiatives must find people with the needed skills, stakeholders and partners, physical resources, and support. 2) If an initiative grows beyond startup, then new skills and people, resilience and a base of resources are needed to survive and keep going. 3) How to gain funding is an important decision for startups. There are two main ways, and both take time and resources to realise, commercialising, to fund further startup development (This leads to diffusion challenges and is called bootstrapping) or public funding (e.g., grants). The approaches can be mixed. 4) Grassroots innovations often use public funding and voluntary work to sustain activities, and these can bring problems. Funding often comes with requirements that must be fulfilled, which can make them difficult to get and take up time from

developing the innovation. The initiative must fit the institutional framework to receive funding, which is difficult as funders can have different frameworks. Funding frameworks are often imposed on initiatives rather than responding to their needs, and funding schemes are often short-term. 5) Finding and obtaining appropriate sustainable technology can be a struggle for grassroots innovators. They might try to modify and use an available technology, which can be difficult. The technology challenge could be reduced by letting innovators take part in technology developments, for example by including them in innovation hub activities or makerspaces (i.e., a workshop/office with tools and equipment needed for the development of innovations). These five intrinsic issues take up a lot of time for grassroots initiatives, which means they have less time to prepare for market shocks (e.g., loss of funding, losing key people, volunteer turnover, burnout of activists or government policy changing). Seyfang and Smith (2007) state that most grassroots projects lack institutional learning, that is, most of the knowledge and experience are held tacitly by involved people. Few grassroots projects have any formal documentation of institutional learning. This makes losing key people a problem as valuable knowledge is lost, and it means that little is learned when grassroots projects fail. This is a systemic issue that hubs can alleviate by documenting learnings from both successful and failed projects. The learnings from projects can later be used by others (or the same people) trying to solve the same or a similar problem.

The concept of diffusion of innovations relates to how, why, and how fast ideas spread between people in a social system after introduction to the market (Rogers, 2003). The author give four main elements that influence the spread, communication channels, time, and characteristics of the innovations and the social system. Seyfang and Smith (2007) regard the diffusion challenge as going from a protective niche market to a wider commercial competitive market. A protective niche is an area that shields, nurtures, and empowers an innovation (Smith & Raven, 2012). A geographical region outside a centralised power grid or simply a rural community could be examples of this concept. Verheul and Vergragt (1995) state that societal groups or users can create their niches, a point that Seyfang and Smith (2010) agree with, stating that: *“Communities can provide niche settings, out of which grassroots innovations can spread, scaleup and be adopted into more commercial and market settings”* (p. 1). The protection of a niche can be beneficial for a grassroots project that is developing a local solution to a local problem. However, the niche might not represent the bigger market and therefore might not prepare the innovation for consumer needs or competition from other firms if the innovation

tries to scale up. Innovation hubs could guide grassroots innovators in developing their innovation for the wider market, both by supplying knowledge about how to do it and resources that enable them to do it. Furthermore, innovation hubs could share knowledge about basic diffusion theory and approaches on how to choose segments of the market to target (e.g., Moore's (2014) beachhead segment strategy). The OECD (2012) states a few critical factors for projects to diffuse from a protective niche to the wider market successfully (as cited by Dana et al., 2021). Dana et al. (2021) analysed two cases of grassroots projects that had failed and found that the OECD's critical factors were the main issues for these failures, these factors are: A) there must be a robust demand from customers for the innovation. B) the business model behind the innovation must be viable. C) the innovators should try different approaches for implementation, and governmental regulations should be beneficial. D) it must have the drive and support from a private entrepreneurial initiative. E) it should use and build on existing infrastructure. However, Dana et al. (2021) identified an additional critical factor that led to the failure of the two projects they analysed, lack of community involvement (more on this later).

2.3.2 Four Barriers to Grassroots Initiatives

Seyfang and Haxeltine (2011) found four main barriers to community-led grassroots initiatives in energy transitions in the UK. 1) The ability to establish strong networks and connections with other actors. 2) Funding and finding time for members to contribute. 3) Broadening public involvement and adding new members to advance the movement weakens the capacity to consolidate and institutionalise. 4) Keeping momentum and evolving the group and its dynamics bring challenges in learning and governance. Seyfang and Haxeltine (2011) also identify that clashes of values, practices, and ideas become more common as initiatives grow. Furthermore, as they grow it becomes more difficult to form a niche, diffuse ideas that challenge the system and keep a socio-technical space (Seyfang & Haxeltine, 2011).

2.3.3 The Social-Cultural-Commercial Trilemma

Jones et al. (2019) analysed remote indigenous grassroots communities in Australia and found that they face some challenges. The authors pose that these grassroots initiatives grapple with a social-cultural-commercial trilemma and lack the managerial and entrepreneurial skills to handle it. Cultural and social tensions and conflicts with stakeholders and competitors can be problematic and might be magnified by local problems (e.g., drug abuse or low level of formal

education) (Jones et al., 2019). The difficulties in dealing with the trilemma affect the work-life balance of entrepreneurs and can cause them to burn out (Jones et al., 2019). The authors suggest ways to handle the cultural tensions and create community-based relationships, these are working through key indigenous family groups, and focusing more on mentoring and supporting managers.

2.3.4 Three Enduring Challenges of Grassroots Innovation Movements

Smith et al. (2014) analyse grassroots innovation movements in Latin America and find three enduring challenges that they face. A) Innovations need to be both locally and widely appropriate. Grassroots innovations often spring from a local context, but to achieve open market diffusion they must also consider the larger market. B) Grassroots initiatives often seek to change local situations, but to succeed and gain traction their innovations also need to fit the current local situation. C) Grassroots movements work in projects to solve local problems with socially inclusive solutions within larger social structures of economic and political power that are the cause of the problems. The larger social structures might inhibit the initiative or may be difficult to change, leaving the root causes in place.

2.3.5 A Triple Tension, Intrinsic and Extrinsic Challenges

Hossain (2018) views scaling up, success, and sustainability as highly interrelated and a connected triple tension restricting grassroots innovators. The author identifies multiple of the same issues as Seyfang and Smith (2007): funding development and expansion, diffusing innovations beyond local niche, and he also uses the term intrinsic challenges. Regarding diffusion, he states that it is difficult, and that even if diffusion succeeds success will be difficult to measure. He suggests that initiatives need support in research and protecting intellectual property (IP) and need appropriate local workforces. Like Seyfang and Smith (2007) he identified the reliance on volunteering as a potential problem. Hossain (2018) states that volunteering and the lack of institutional support and infrastructure mean growth could create issues of local popularity decreases. Hossain's (2018) intrinsic challenges closely resemble Seyfang and Smith's (2007), with challenges like high volunteer turnover, policy changes, key people leaving, skill requirements, and reduction in funding. In contrast, Hossain (2018) considers extrinsic challenges as the second main type of issue instead of diffusion-related challenges. These are related to context specificity, geographical rootedness, ideological

commitment, and competition. Furthermore, he states that grassroots initiatives often have an issue with long-term commitments, making long-term goals difficult to achieve.

2.3.6 Diagnostic Tool, Phases, and Community Inclusion

Dana et al. (2021) developed a diagnostic tool to analyse important potential problems in grassroots (and inclusive) innovation projects. The diagnostic tool is inspired by three theoretical models: the creativity theory (Amabile, 1996), the innovation adoption/diffusion model (Rogers, 1962), and the Five Forces Model (Porter, 1980). The models inspire a series of questions about the main problems during different phases of development of grassroots innovations. The three phases of the diagnostic tool are the inception phase, the protective niche phase, and the open market phase. The inception phase is inspired by the creativity theory and includes the identification and analysis of problems, generation of ideas, and appraisal of the appropriateness of the idea to the problem. The protective niche phase is inspired by the diffusion model. The diffusion model includes five characteristics. 1) The relative advantage of the innovation over the alternatives. 2) The compatibility of the innovation to regulations, institutions, infrastructure, and potential adopters' needs, culture, and experiences. 3) The complexity of the innovation, i.e., how easy the idea and innovation are to grasp. 4) The trialability of the product for potential adopters. 5) The observability of the innovation by additional potential users. The protective niche phase entails prototyping the innovation and refining it by letting potential adopters test it and improving it based on the tests. Dana et al. (2021) consider the diffusion model in this phase, while other authors (Seyfang & Smith, 2007; Smith et al., 2014; Hossain, 2018) argue that diffusion is important in taking an innovation from the protective niche to the open market. The last phase is the open market phase, which regards scaling up the business and launching the innovation on the open market. Inspired by Porter's five forces model (Porter, 1980), questions regarding competitors, substitutes, new entrants, suppliers, and buyers are posed in this phase. Dana et al. (2021) added a force to their framework, the bargaining power of retailers/distributors, as they can have power over access to the innovation and influence the perception of it. The forces are important when establishing a place in the market, but the framework is made for gauging industry rivalry and profitability. These are two important factors to consider before going into an industry or a market, which means that it is wise to consider them before deciding on a market and developing a prototype. Maybe Porter's five forces are better suited to the inception phase of the framework. However,

grassroots innovations typically regard products in markets where competitors are scarce (at least locally).

Dana et al. (2021) tested the tool by applying it to two documented failed Namibian grassroots innovation projects. The first was a project by a non-profit organisation in 2011, they worked with local businesses, families, and leaders from the community in a marginalised community in Namibia. The second project was a re-launch of the first project by a student group from Worcester Polytechnic Institute in 2014, the students worked with employees of the non-profit organisation and local citizens. Dana et al. (2021) argue that both projects suffered from not getting the OECD's critical factors right, but that they also missed another critical aspect. The projects did not sufficiently include opinions and validations from the local community, which should be considered in every phase of projects (Dana et al., 2021). What Dana et al. (2021) are calling for is essentially design thinking in the development of projects. They do however consider the aspect as the importance of including the local community in the project, suggesting it as a mixture of grassroots innovation and inclusive innovation, and propose a new concept, socially-inclusive grassroots innovation. They define it as (Dana et al., 2021): *“products, services and processes developed to address specific local challenges and opportunities, whose success depends on directly involving and including the project stakeholders in each stage of innovation design, implementation and exploitation.”* (p. 9).

2.3.7 Five Factors to Support Grassroots Innovation

Smith and Stirling (2018) investigate grassroots innovation and how it can contribute to sustainable development by being more inclusive. The authors call this aspect of inclusiveness innovation democracy and define its goal as enabling the least powerful (marginalised or low-income) people and communities to affect in which direction an innovation that will affect them should go. They base their findings on 15 years of experience with case studies in grassroots innovation in the UK, South America, and India. The authors find that grassroots innovation can contribute to innovation democracy and give five factors to consider supporting it. Smith and Stirling (2018) give five factors that societies can consider to better support and benefit from grassroots initiatives. The authors don't give recommendations to specific organisations or groups because they state that measures for individual actors require complementary actions from other actors (Smith & Stirling, 2018). Furthermore, they state that

the inclusion aspect is more about changing the relationships between actors, rather than individual actors' specific interventions. The five factors are culture, infrastructure, training, investment, and openness.

Smith and Stirling (2018) state that the culture of engineers, researchers, policymakers, investors, campaigners, and other actors in the mainstream innovation processes should be changed. These actors should reflect on their positions, assumptions, and agendas when engaging with grassroots initiatives. Additionally, they should deeply understand the initiatives, their reasons, motivations, values, and aspirations. Infrastructure needs to expand to support grassroots innovation, this includes hard infrastructure like workshops, roads, offices, regional ICT, and availability of tools, but also soft infrastructure like expertise and experience in community development and in engaging with people in design, and skills in how to use the infrastructure. The authors make a specific example that innovation-related facilities should be more open to grassroots involvement and communities and that the structure should be more porous (Smith et al., 2014, as cited by Smith & Stirling, 2018). The third factor is training, and it should combine practical and intellectual skills. Training should also be more problem-oriented and interdisciplinary. Furthermore, universities should support grassroots education and science initiatives. Universities are not positioned well to do that in their current form (Smith & Stirling, 2018), but such capabilities could be considered if a new university institution is built. How society invests in grassroots initiatives could be altered to benefit them more. Grassroots initiatives don't always follow a commercial logic which makes some forms of investment difficult, but promoting the social value of initiatives can help alleviate this problem (Smith & Stirling, 2018). Crowdfunding is a method that can help innovators in funding their prototyping, but going further and creating a marketable product often requires more capital and institutional support (Smith & Stirling, 2018). Funding and investment mechanisms in grassroots innovations could greatly benefit initiatives (e.g., micro-funding for innovators). Scaling up through accelerator programs is a way for initiatives to gain funding, this is however not easy to attain for initiatives that don't follow commercial logic or don't have capabilities to promote their idea. The last factor is openness and regards both institutions and mindsets. The state and policymakers should be more transparent and take in citizens' viewpoints in their decisions about research, technology, and requirements of innovations. This can be done with focus groups, panels, and juries. Opening infrastructure and training to the public would increase the capabilities of innovators and engagement. Sharing technology, IP,

and knowledge would benefit grassroots innovation. Inviting diversity and open-endedness is good when including the public in development. Lastly, being open to protests and criticism helps to understand marginalised issues and to make innovation more inclusive.

2.3.8 Challenges to Grassroots Innovation, Key Enablers, and Recommended Support

Bernstein et al. (2021) wrote a report analysing grassroots innovation in developing countries for the London School of Economics and Political Science and UNDP Accelerator Labs. They used a mixed-method approach with a thorough literature review, qualitative interviews, and quantitative surveys. In the literature review, they reviewed barriers to grassroots innovation in developing countries and policies that have worked historically and more. Based on the literature review they conducted interviews with seven UNDP Accelerator Labs, four innovators, and a government institution, and surveyed people connected to the UNDP Accelerator Labs. The authors identified multiple challenges to grassroots innovation and then gave recommendations to deal with them.

Bernstein et al. (2021) point to identified challenges and enablers of grassroots innovation. The main challenges include a lack of financial capacity and financial institutions, lack of communications and promotional facilities. Insufficient education and training and technological advancement are also hampering grassroots innovations. Bernstein et al. (2021) note that ICT, specifically mobile subscriptions and internet access, and lack of managerial and entrepreneurial skills training in education are critical issues. They mention that people seek those skills outside the formal educational system. Bernstein et al. (2021) state two key enablers of grassroots innovation, namely financial support and providing communication and promotional facilities to innovators. Furthermore, they note the important role of the interviewed UNDP Accelerator Labs in building trust, sharing resources, and emerging practices (Bernstein et al., 2021). Some of the challenges identified by Bernstein et al. (2021) are like other authors' challenges, for example, financial capacity (Seyfang & Smith, 2007; Seyfang & Haxeltine, 2011), lack of managerial and entrepreneurial skills in education and training (Jones et al., 2019). But in contrast to Hossain (2018) who states that grassroots initiatives need support in defending their IP, Bernstein et al. (2021) state that IP doesn't seem to motivate grassroots innovators or the growth of initiatives. The latter seems more plausible

as it is based on interviews and a survey with innovators and because grassroots innovations seldom are highly technical.

Bernstein et al. (2021) state that the success of grassroots innovations is heavily dependent on context and that it, therefore, is difficult to give recommendations to support grassroots innovation that works universally. Nonetheless, they give recommendations that three levels of actors can use to support grassroots innovation. These levels are National Governments, Initiatives (defined as a body that handles related budgets, assesses grassroots innovations in the nation, and connects government with local authorities & grassroots innovation networks), and Local Authorities & grassroots innovation Networks (defined as local actors like innovation labs that handle operations in grassroots innovation). The recommendations most relevant to innovation hubs are the latter, which are (Bernstein et al., 2021); 1. Facilitating Access to Financial Resources by acting as guarantor for private loans and by receiving and distributing grants. 2. Designing and offering Professional Training Programmes. 3. Empowering communities for shaping Civil Society and Social Movements. However, some of the recommendations for governments and initiatives might also be useful for hubs. For example, providing co-creating spaces, promoting the culture of innovation at the grassroots level by attracting media coverage and holding events, and helping evidence-based and data-driven decision-making in the field by data gathering and solution mapping.

2.3.9 Summary of Challenges

Multiple specific challenges are put forth in the literature and most of these fit into the two categories of challenges of Seyfang and Smith (2007). The intrinsic challenges relate to among other things resources, retaining volunteers, training, organisational difficulties, and networks, and challenges identified by multiple other authors can be classified in this category (Bernstein et al., 2021; Seyfang & Haxeltine, 2011; Jones et al., 2019; Smith et al., 2014; Hossain, 2018). For example, Hossain (2018) identified the extrinsic challenges of geographical rootedness, context specificity, and ideological commitment, these challenges do relate to the intrinsic challenges in that they can be reduced with appropriate training and volunteer retention methods. And the social-cultural-commercial trilemma of Jones et al. (2019) also relates to intrinsic challenges as they can be reduced with training managers and network-building. Diffusion is also a common theme in the reviewed literature (Smith et al., 2014; Hossain, 2018;

Dana et al., 2021), most view it as taking innovations from a protective niche to the open market. Some of the authors give recommendations for solving presented problems. Smith and Stirling (2018) suggest five factors to support grassroots innovation, culture, infrastructure, training, investment, and openness, some of which hubs could consider, particularly culture, infrastructure, and training. Bernstein et al. (2021) recommend hubs act as guarantors for loans and manage and distribute grants, offering appropriate training, and empowering communities. Dana et al. (2021) developed a framework of three phases to support grassroots projects, the framework focuses on idea development, prototyping, and diffusion, and the authors also conclude that including the community in all phases is crucial. This inclusion could be achieved by training innovators in design thinking and agile development. Hubs could use the framework to support grassroots innovators.

2.4 Research Questions

In the literature review, a few things were concluded, the differences between innovation and grassroots innovation, challenges to grassroots innovation, and some ways to support it. Grassroots innovation is innovation for the poor by the poor, and it differentiates itself from traditional innovation as done with very few resources, solving local self-experienced problems, done by poor people typically outside the regular innovation system. Grassroots innovators face many problems, but most of these can be classified as intrinsic or diffusion related. For example, lack of funding, lack of networks, lack of training, lack of organisational capabilities, lack of infrastructure, and retaining volunteers and momentum. No recommendations specifically targeted how innovation hubs can support innovators were found, but they could consider the five factors of Smith and Stirling (2018), the recommendations of Bernstein et al. (2021), and the three-phased framework of Dana et al. (2021).

The focused context of this study is developing countries, specifically countries in sub-Saharan Africa and mainly Rwanda. Rwanda is a small developing country in East Africa, with low levels of crime, a unique demography, few natural resources, and a strong dedication to building an effective innovation system. The Rwandan government is focusing on innovation to take the country out of poverty, because of this many innovation hubs have been started there (especially in the capital Kigali). Now the University of Rwanda is setting up the first

university-embedded innovation hub in the country called Grid Innovation and Incubation Hub (GIIH), which is the main interest of this study. The other organisation in focus in this study is 2Scale, which is active in ten African countries, but the interviewed representative is active in Nigeria. More details will be provided about the contexts of Rwanda, GIIH, and 2Scale in section 3.2.

The issue is important, researching it is justifiable due to calls from literature and because university-embedded innovation hubs are a newer kind of actor developing in the Rwandan innovation system (Cherunya & Ahlborg, 2020). Cherunya and Ahlborg (2020) suggest that studying incubation programs that target organized community groups in sub-Saharan Africa (e.g., 2Scale) would be interesting. Yongabo (2021) states that the concept of national innovation systems is criticised for not giving enough detail on how system actors can collaborate. For example, how innovation hubs can collaborate with grassroots innovators and other innovation hubs. The research question aims to fill the theoretical gaps that Yongabo (2021) and Cherunya and Ahlborg (2020) highlight and make a practical contribution. The practical contribution would help innovation hubs understand how they could reach marginalised communities, support grassroots innovators, co-create with grassroots actors, increase grassroots innovation, design better-fitting products/services, and identify more problems of these communities to solve in the Rwandan context. To manage this and give a more structured response on how hubs can support innovators two research questions are devised. The separation of the questions is appropriate as the activities are distinctly different from each other. The two questions are based on different aspects of supporting grassroots innovators, identification of and connection with innovators, and support of innovators.

- I. How are innovation hubs identifying and connecting with grassroots innovators?
- II. How can university-embedded innovation hubs support grassroots innovators in their efforts?

The aspects stem from different activities of support and problems faced by innovators. Identification and connection are logical first steps if an innovation hub wants to support an innovator, they first need to find an innovator to support. There is some interest in how to identify innovators to support in the academic literature (Goeldner et al., 2017). As the number of innovators hubs can support at any given time is finite and hubs have goals (e.g., maximise

profits or value to society) it is important to identify and pick out the innovators that can contribute the most towards the goals of the hub.

This study aims to compare the grassroots innovation-supporting practices of the university-embedded innovation hub at Kigali Innovation City (KIC) in Rwanda and the best practices of another hub which has strong capabilities in this area. The practices of the two hubs will be analysed. Then, recommendations of practices will be made for the university-embedded innovation hubs.

3 Methods

In this section, the research strategy, research design, data analysis, and data analysis will be presented and argued. Firstly, the research strategy. Secondly, the research design and the two cases. Thirdly, the collection methods. Lastly, the methods of analysis.

3.1 Research Strategy

The stated research questions made a qualitative research strategy most appropriate. There are multiple reasons for this, for example, the goals, intentions, and focus of the study (Bell et al., 2022). Firstly, the project aimed to explore and generate theory rather than test it. This is hinted at by the *how* in the research questions, a more quantitative question might be a yes-or-no question or regard a causality. Exploring research and these more qualitative methods requires qualitative strategies. Secondly, as context is an important factor for local innovation systems' effectiveness it was important to understand when analysing local grassroots innovation supporting practices. When the context is important to a study, then using a qualitative strategy with its focus on deep/rich data focusing on words rather than numbers is appropriate. Lastly, a typical qualitative strategy tends to focus on the perceptions of the participants rather than of the researcher. This was also the intention of this project. To understand the needs of actors in the innovation system, the perceptions of the actors must be understood.

Although this paper was explorative it followed an abductive reasoning approach, meaning that the research was more interpretive than inductive or deductive. Inductive research tends to collect data and generate theory, while deductive research usually creates a hypothesis from theory and tests it statistically with collected data. Abductive research, however, is an alternative to the latter research approaches and kind of lies between the two methodologically. The approach is gaining popularity in business research and works by iterating between theory and empirical observations (Bell et al., 2022). The approach is a potential way to overcome the weaknesses of the two other approaches, that is the problem of deciding which theory to test and the amount of data needed to generate theories. Abduction usually aims to understand an unexplained phenomenon (Bell et al., 2022), and that was the goal of this study as well, which made it a fitting approach. The goal of this study was to analyse under-researched practices of innovation hubs in supporting innovators and grassroots innovation.

3.2 Research Design

In this project, a comparative case study of two organisations was developed, and to make high-quality research reliability and validity must be considered (Bell et al., 2022). Reliability regards the repeatability, consistency of research design, and how well the study is designed. Two types of reliability must be considered in qualitative research, internal and external (Bell et al., 2022). Internal reliability refers to if all members of a research team interpret the findings in the same way. This is usually strong in qualitative studies with multiple members; however, this work was written by a single author. As this article was conducted by a single author interpretation might be influenced by one person's experiences, which can lead to some researcher bias. To reduce bias interpretations were carefully made attempting to find different interpretations of the findings. Nonetheless, internal reliability should be considered when valuing the conclusions of this study. External reliability regards the replicability of the study. It is typically problematic for qualitative research as the social settings and relationships between the interviewer and interviewees are impossible to replicate exactly. To ease the replication the research design, research methods, and findings are clearly defined, described, and presented. As for validity in qualitative research, internal and external should be considered (Bell et al., 2022). Internal validity regards whether generated theories are close to empirical observations. For qualitative research, this form of validity is usually strong as the researcher has spent some time with the subjects and therefore has gained a deeper understanding of their contexts and their social environments, which was also true for this study. External validity regards the generalisability of the findings and is often problematic for qualitative studies, especially for case studies, which this was. That is due to the typically small sample sizes of case studies. Generalisability between social contexts is weak in qualitative studies, but this is also part of the strength of qualitative studies. Qualitative studies tend to have small sample sizes but gather more and richer data on each observation, which is better for explorative studies.

Multiple actors in the innovation system were of interest to the study, but two were especially important. These are the University of Rwanda's Grid Innovation and Incubation Hub (GIIH) and 2Scale. 2Scale is the largest incubator for inclusive agribusiness in Africa and is active in ten African countries. 2Scale works with grassroots innovation and has been active for multiple

years. They were the main subjects of analysis in this research design. The design was a comparative case study analysing the practices of the innovation hubs regarding support of grassroots innovators to see what they were doing, what they could learn from each other, and especially what practices the developing university-embedded GIIH could use in its context. More specifically it was the incubation and acceleration programs of the two innovation hubs that were of main interest because they are major activities in the support such innovation hubs give to innovators. To understand these programs managers of the two organisations and incubatees of GIIH were interviewed. Interviewing incubatees as well as managers helped collect rich data about the support programs the incubatees are benefitting from. Views of managers and incubatees from GIIH were compared to gauge if managers and incubatees have the same views of the support, the challenges the incubatees are facing, and any unsolved challenges. If there are misalignments it could mean that managers are misunderstanding a challenge faced by incubatees, have a strong belief in a support that isn't helping much, or that managers are unaware of a challenge incubatees are facing. Comparing the views can help understand if the support is well-suited to alleviate the challenges of the incubatees. Incubatees are only interviewed from GIIH. This is because the university-embedded innovation hubs were the main subject of the study and to understand which support practices GIIH can use the context of GIIH must be understood. Interviewing managers from 2Scale generated ideas (support practices) that GIIH could try out, interviewing incubatees from 2Scale would have showed if the ideas work in 2Scale's context and for an independent hub with 2Scale's goals and structure. That might be interesting for another study, but it was not the purpose of this study.

The study was a comparative case study because the practices/programs, contexts, and roles of the different hubs in their innovation systems were the main points of interest to the study. GIIH was an interesting subject as it is a large new university-embedded hub in a developing economy context. 2Scale was an interesting subject, due to its multi-year experience in supporting grassroots communities and innovators, and hence its expertise in that. Innovation hubs and particularly University-embedded innovation hubs are newer actors in developing innovation systems, and the innovation systems in developing economy contexts are under-researched. Because of the above-mentioned reasons and the fact that hubs are a relatively new development in this part of the world these two subjects/cases were interesting on their own, which is a requirement for a case (Bell et al., 2022). Innovation hubs and supporting grassroots

innovation are under-researched topics and studying the hubs' practices could help inform new best practices of other hubs. GIIH's young networks and structure could more easily be shaped to support grassroots initiatives, and its size means that changes could bring a large impact. The number of subjects in the comparative case study design should be chosen carefully due to the trade-off between the number of cases and depth of research and understanding of specific contexts. Due to this trade-off, only two subjects were analysed in this study to make sure their contexts are better understood. In the following two sections, the contexts of the GIIH and 2Scale are presented.

3.2.1 The Rwandan Context and Grid Innovation and Incubation Hub

Rwanda is a small developing nation in sub-Saharan Africa, with ambitious growth aspirations. It is land-locked with a young population of about 13 million people, and a high population density, that is situated in East Africa between Tanzania, Burundi, Uganda, and the Democratic Republic of Congo. The country has a difficult history with scars from colonialism and the 1994 genocide. Rwanda gained its independence from Belgium in 1962. The population is young, 70% of the population is below 30 years old (RDB, 2023), and 43% of the population is below working age (0-15) (NISR, 2018). If Rwanda manages to keep their growth and development steady Rwanda will experience a population boom in the coming centuries due to its young population. In 2021 about 82 per cent of the population lived in the countryside (Statista, 2023). The economy is based on the services sector, tourism, and agriculture. About 70% of workers work in agriculture (NISR, 2018), which historically has been done under subsistence farming conditions, however, the sector is moving away from these conditions (Yongabo, 2021). If there is a population boom in the countryside and farming practices become more large-scale and efficient, then it is likely that a strong urbanization wave will take place in Rwanda due to the lack of jobs in the countryside.

Rwanda has limited natural resources and the Rwandan government is aiming to use innovation as a tool to accelerate the growth of the nation's economy (World Bank, 2022a), and is therefore trying to make the national innovation system more efficient. The government's end goal is to transform the country into a knowledge-based economy. Hence, over the last decades, the concept of innovation hubs has gained footing in Rwanda, and multiple hubs have been started in the nation. Most of these are independent innovation hubs. However, now a large university-

embedded innovation hub is being developed by the largest and top-ranked university in the country, the University of Rwanda, that innovation hub is called Grid Innovation and Incubation Hub (GIIH).

The government of Rwanda is investing heavily in innovation, which is showcased by the large innovation smart city project they are developing. To boost its innovation Rwanda has created a master plan to build the so-called Kigali Innovation City (KIC) (RDB, 2021). The plan is to build a mixed-use 61-hectare smart city with four universities, start-up incubators, R&D facilities, accommodations, retail, and spaces for private firms. The project is a collaborative development led by Africa50 and the Rwandan Development Board (RDB), but a multitude of other stakeholders are involved (e.g., the universities and actors from the private sector). The KIC megaproject is an important step towards reaching Rwanda's goal of becoming a knowledge-based economy.

In addition to the Kigali innovation city, they are developing a university-embedded innovation hub, Grid Innovation and Incubation Hub. GIIH is owned by and embedded into the University of Rwanda's campus. The embeddedness of the university gives it a unique position and a strong connection with academia and students. The hub is sponsored by the World Bank, and is under development by the university with help from the Gothenburg Centre for Sustainable Development (GMV). The GMV is a collaborative organisation between two Swedish universities, Chalmers University of Technology, and the University of Gothenburg, both have experience with innovation, incubation, and acceleration. The goal of GMV is to boost sustainable development in the world.

The GIIH project is an interesting opportunity to build a new large-scale innovation hub in a theory-driven way. Although GIIH is already active (it has been for a couple of years) the networks, partnerships and support programs which are important aspects of innovation hubs are not established/formed yet. This means that the innovation hub is still under development. This is an appropriate time to affect the hub as established networks and systems can suffer from inertia. Hence, changing old innovation hubs to align with theory can be difficult as old networks can be difficult to alter. The project brings an opportunity to build a hub that challenges the East African hubs that were built with the structure of the hubs in the European

and American innovation systems (Cherunya & Ahlborg, 2020). The new innovation hub could be developed to fit the East African context by taking its factors and challenges into account. However, how these factors and challenges should be considered by innovation hubs hasn't been sufficiently studied yet, particularly regarding support of grassroots innovation, which calls for research on the subject. Therefore, the case of the GIIH project provides a chance for this study to make an impactful contribution to theory and practice by researching how the hub ought to be designed based on its context. Equally interesting is the African incubator 2Scale, although, for other reasons.

3.2.2 2Scale

2Scale is an inclusive agribusiness incubator and accelerator, it is the largest in Africa and is active in ten African countries. These countries are Ethiopia, Ghana, the Ivory Coast, Kenya, Mali, Nigeria, Burkina Faso, Niger, South Sudan, and Egypt (2Scale, n.d.), most of the countries are in sub-Saharan Africa. 2Scale is funded by the Ministry of Foreign Affairs of the Netherlands (MFAN) and is supported by the Department of Inclusive Green Growth of the Directorate General of International Cooperation (DGIS) at the MFAN. The Department of Inclusive Green Growth works to ensure universal access to and wise use of natural resources and 2Scale's goal is to encourage and accelerate inclusive agribusiness.

2Scale has been working with inclusive agribusiness and grassroots innovation for more than ten years, has ambitious goals and has made an impact. 2Scale present some goals on their website (2Scale, n.d.): To improve at least 1.5 million base-of-the-Pyramid (BoP) consumers' access to healthy food, by working for inclusion in targeted value chains. To improve the livelihoods of 1 million smallholder farmers, with a particular focus on gender equality and youth, by providing better inputs, financing, training in negotiation and agriculture practices, and more. To develop 15'000 Micro, Small, and Medium Enterprises (MSME) and farmer producer organisations into inclusive businesses. In 2021 2Scale had improved food access for about 957 thousand base-of-the-pyramid consumers (2Scale, 2021). Furthermore, up until and including 2021 they boosted productivity and market access of almost 420 thousand smallholder farmers and ensured the inclusion of about 454 thousand producer organisation members into value chains (2Scale, 2021). 2Scale has helped improve the lives of many people, but 2Scale is not one single entity, it is created by three parts.

The three parts that constitute 2Scale are SNV, IFDC, and Bopinc (2Scale, n.d.). IFDC stands for the International Fertilizer Development Center. It is a public international organisation active in developing countries which helps smallholder farmers by teaching them to handle fertilisers properly. The IFDC helps farmers boost productivity and economic growth and work more environmentally friendly. The second part is Base-Of-the-Pyramid Innovation Center (Bopinc), whose mission is to develop commercially and socially viable business models and activities, where the people from the base-of-the-pyramid are consumers, producers, and entrepreneurs. Bopinc does this by helping entrepreneurs or companies to create services and products together with and for the base-of-the-pyramid. Lastly, the Netherlands Development Organisation (SNV), whose mission is to enable sustainable and more equitable lives for all by enhancing capacities and catalyse partnerships that transform energy, water systems, and agri-food production. They focus on improving people's income and work opportunities as well as access to energy, water, hygiene, and sanitation. These three parts work together closely to support innovators (called business champions by 2Scale).

To study ways to co-create with grassroots actors Cherunya and Ahlborg (2020) suggested that the practices of 2Scale that target organised community groups would be interesting to analyse. 2Scale manages a portfolio of public-private partnerships (PPPs) in agribusiness and agri-industry to develop business clusters around innovators. 2Scale has established and developed over 70 PPPs since 2018. 2Scale defines innovators (business champions) as entrepreneurial producer organisations or local SMEs on their website (2Scale, n.d.). These could, for example, be farmer groups, entrepreneurs, or small firms that produce food oils. However, from interviews with a manager at 2Scale innovators (business champions) are categorised into three groups: lead firms (multinational firms), local SMEs, and farmer cooperatives (or farmer groups). Traditionally incubators support innovators/entrepreneurs and their projects through programs where they give access to training, support with idea development and network building, and funding. However, to help develop business clusters and improve the lives of base-of-the-pyramid consumers 2Scale supports innovators and other partners with many different services. Smallholder farmers & farmer groups (producer organisations) benefit from training, financing without security, help with collective input purchasing and marketing, and extension support from 2Scale. 2Scale help develop agribusiness clusters and value chains,

these are networks that support producer organisations. The networks connect producer organisations with local SMEs and are built around entrepreneurial innovators. The networks are supported to become self-sustaining and professional. Producer organisations use networks to gain information, finance, and access to inputs. SMEs play a critical role in the agribusiness clusters; they process products and provide inputs and services. These can be small processors, suppliers, service providers, and product traders. 2Scale provide these with business and technical support so they can grow their business and the capacities of the cluster. Furthermore, 2Scale targets efforts on base-of-the-pyramid consumers to create products and markets. They gather market and consumer insight to help SMEs and producer organisations to develop new products for base-of-the-pyramid consumers and work with marketing and distribution to create consumer demand and ease logistics. Central in the approach to impact low-income markets (2Scale, 2022): Availability, affordability, accessibility, and awareness.

There are many examples of transformative partnerships and clusters 2Scale has helped develop. In Mali, 2Scale helped onion farmers boost quantity and quality by giving them access to seed traders and new seed varieties that grow also during the rainy season. In Ethiopia, 2Scale helped establish vegetable oil production by connecting and supporting farmers and SMEs. In the Ivory Coast, 2Scale helped improve quality and quantity in the production and marketing of local rice by training farmers and creating partnerships between farmers and SMEs. In Nigeria, 2Scale boosted women and youth empowerment by training them to make them employable and by creating financial partnerships among farmers.

3.3 Collection of Data

The gathered data were both primary and secondary. The primary data was gathered by conducting semi-structured interviews with representatives from GIIH and 2Scale, and incubatees from GIIH. The data gathered in the interviews revolved mainly around the incubation and acceleration programs of the two innovation hubs and the interviewees' experiences with them as these support programs are the chosen focus to understand the support of innovation hubs. Furthermore, gathering data through interviews will benefit the study by providing rich detailed answers and indicating the perspectives of the respondents, which is why it was chosen over alternative methods like questionnaires. The secondary data were gathered from relevant academic articles on grassroots innovation and innovation systems and

are mainly used to inform the literature review and give context to understand the findings. These methods are typically best for qualitative strategies and as a qualitative strategy was best for the research question at hand, they were suitable for this study.

Semi-structured interviews were appropriate for a few reasons. It gives a sufficient trade-off between focus and flexibility (Bell et al., 2022). The focus was required due to the short available time of the study and the aim to compare activities between different subjects. The flexibility benefitted the study as it allowed for relevant follow-up questions. The approach made it easier to compare the activities of the different subjects as the same questions were asked. Unstructured interviews are better if finding the true opinions of interviewees is important to the study and time is abundant, however, focus and comparability were more important to this study. However, some unstructured interviews were also held with managers from GIIH and 2Scale before semi-structured interviews upon request. They helped build rapport and provided useful information.

The interviewees were chosen out of purposive/strategic criteria and convenience. As connections were established with the GMV early in the process and due to lack of time, the connection was utilised to find appropriate representatives to interview. The strategic criteria for potential interviewees were management from GIIH and 2Scale and incubatees from GIIH. Interviewing these actors helped understand practices supporting grassroots innovation and the local context. Interviews were conducted via video meetings as the interviewees were based outside Sweden.

All the interviews were conducted via video meetings. Which was a strategic choice due to the geographical distance to the interviewees who are based in Rwanda and Nigeria. Opting for video interviews has pros and cons (Bell et al., 2022). In addition to overcoming distance, video interviews can be easier to fit into the schedule for busy interviewees, but Wi-Fi connections might be unstable, and interviewees might be more likely to fail to be present for video interviews (Bell et al., 2022). Both these potential issues were problematic for this study but were manageable. Connections broke during interviews on a few occasions and that affected the flow of the interviews, but it did not affect the interviews much as all interviewees agreed to prolong the interviews. Multiple interviewees failed to be present for interviews, but this

was managed by rescheduling. Another issue with online interviews is that body language and non-verbal cues which are important parts of communication might be lost. To manage this challenge interviews were video recorded, and all transcriptions were corrected while at the same time analysing the video recordings. This helped take part (although not all) of such cues into account when correcting transcriptions. It also gave a better understanding of the coding and analysis of the findings.

The interviews were held and recorded with Zoom and automatically transcribed using the transcription software Avrio. Compared to automatic transcription, manual transcription gives the transcriber a deeper understanding of the material (Bell et al., 2022). However, automatic is more appropriate for this project due to lack of time. The interviews were then automatically transcribed and checked for errors with the video recordings.

Separate interview guides were made for managers and incubatees. The interview guide for managers had twelve questions and the interview guide for incubatees had fourteen questions. Both are divided into three parts, introductory questions, main questions, and finishing questions (see Appendix 3). The introductory questions were meant to make a soft start to the interview, increase the comfort level of the interviewee by letting them answer some easy factual questions at the start, build rapport, and gather some information about the interviewee. The main questions revolve around the topics of the two research questions and problems faced by grassroots innovators: identification & connection, support provided, and problems innovators experience. The finishing questions are meant to round off the interview and number ten (twelve for incubatees) is designed in the example of Bell et al. (2022) to catch the experience of the interviewee. The eleventh (thirteen for incubatees) question is a catch-all question meant to give the interviewee the chance to comment on overlooked topics or add to their previous answers (Bell et al., 2022). Prompt questions are included in the interview guides, these were used if those topics were not covered in the interviewee's answers, they added flexibility to the interview guide (Bell et al., 2022). To reduce bias in interviewees' answers questions have been designed to be non-leading (Bell et al., 2022).

Nine interviews were conducted six with managers and three with incubatees from GIIH (see table below). The managers at GIIH were the Head of Grid Innovation and Incubation Hub

who runs the innovation hub and has deep knowledge in strategic and organisational matters as well as some experience in supporting incubatees. The product development manager at GIIH works with supporting incubatees daily and has a rich knowledge of the incubation programs of the innovation hub. The manager from 2Scale was the thematic coordinator on green innovations and country team leader of IFDC in Nigeria and Egypt who manages a portfolio of partnerships with incubatees, has organisational responsibilities, and works hands-on with incubatee projects. Interviews with incubatees provided knowledge of their experiences of challenges and support.

Interviewee	Title / Affiliation	Date / Duration	Medium of interview
Respondent 1 (R1)	Head of Grid Innovation and Incubation Hub / GIIH	28 March / (52 minutes) 13 April / (49 minutes)	Held and recorded through Zoom
Respondent 2 (R2)	Product Development Manager / GIIH	28 March / (28 minutes) 14 April / (57 minutes)	Held and recorded through Zoom
Respondent 3 (R3)	Incubatee / GIIH	20 April / (54 minutes)	Held and recorded through Zoom
Respondent 4 (R4)	Incubatee / GIIH	25 April / (37 minutes)	Held and recorded through Zoom
Respondent 5 (R5)	Incubatee / GIIH	29 April / (58 minutes)	Held and recorded through Zoom
Respondent 6 (R6)	Thematic coordinator on green innovations and country team leader of IFDC in Nigeria and Egypt / 2Scale	06 April / (27 minutes) 21 April / (73 minutes)	Held and recorded through Zoom

Table 1: This table presents the interviews, who they were with, how long they were, and how they were conducted and recorded. Source: developed by the author.

3.4 Methods of Analysis

The analysis methods for both primary and secondary sources will be qualitative and thematic. Thematic analysis and coding are appropriate for analysing interview transcripts as they are well-suited for the rich and messy textual data of interviews (Bell et al., 2022). Grounded theory is an alternative to thematic analysis, but due to its iterative process, it was not a good fit for this project due to lack of time. Coding is well-suited as it is simple and a quite flexible method of analysis, it can be used on both interview transcriptions and documents, which means the results of the analysis will be comparable. The problems with coding lie in subjectivity and losing context, parts of the story can be lost when bits are extracted from the transcriptions (Bell et al., 2022). More quantitative methods of analysis are an alternative to the chosen methods. However, these would not be appropriate for the study as the strategy is qualitative and the research question is more theory-generating than theory testing, and quantitative methods are more structured before data collection and don't let theory emerge out of the data as easily (Bell et al., 2022). Hence, these methods were in alignment with the research questions and the strategy.

The coding in this project was completed stepwise and consists of three levels. There are multiple ways coding can be conducted, and none of these can be considered the correct way, however, coding is often done in steps or with levels of code (Bell et al., 2022). The three levels in this study were first-order concepts, second-order concepts, and aggregated constructs, and they were developed sequentially. This is inspired by the three-level coding presented by Bell et al. (2022) and by the method of concept development by Gioia et al. (2013). The first level mostly summarises what the interviewees said and emerged from the text, this method helps theory to emerge from the material and is inspired by grounded theory (Suddaby, 2006). The second level is meant to create a deeper awareness of the text by recoding, comparing, consolidating, and regrouping (Bell et al., 2022). The third and last level of code entailed finding connections between codes and properties of codes to gain a deeper understanding. The concepts were then visualised with a Gioia-inspired framework (Gioia et al., 2013) to analyse connections further and present findings. The concepts and constructs were then be discussed with the research questions in mind.

4 Findings

In this section, the findings from the interviews are presented. The findings are separated from two perspectives, managers from hubs and incubatees from hubs. The findings from the managers are presented first.

4.1 Managers

In this sub-section, the findings from the interviews with managers are presented. Different themes from the interviews related to the research questions are presented.

4.1.1 Identification & Connection

In this sub-section, the findings based on interviews with managers related to the first research question are presented. Three sub-themes are considered with the overall theme of the first research question, which relates to the identification of and connection with incubatees. These three themes are the application to the programs, the selection process, and the criteria considered to accept candidates. In the following paragraphs, the three themes are presented.

Application: The two organisations have different approaches to the application process for their programs. GIIH has a more traditional open application period, the call for applications comes when the university thinks it is appropriate when they think there is an “*amounting big number of doable concepts*” (Interview, R1/GIIH). The application is done digitally, and the call is open for twelve days. GIIH put the call out on the internet, and it is “*visible through our websites, and we share through the social media*” (Interview, R1/GIIH). 2Scale on the other hand has multiple ways of finding candidates for the program, both seeking candidates and being sought out by candidates. Some candidates simply know what 2Scale does, have an idea that they think 2Scale can help with, and get in touch. 2Scale is always open to new opportunities and picks up the conversation. R6 states that 2Scale also seeks out innovators when they need a specific innovation or need a solution to a specific problem. “*We search for them talking to our network, talking to our partners, sometimes we do an advert. [...] One other thing we have used is a competition, more like an SME competition.*”. 2Scale has used its network, adverts, and contests to find innovators and innovations.

Selection: The selection processes of the two programs are different, for example, GIIH has a much longer and more complex process. On one hand, 2Scale does a value chain analysis workshop they call *Diagnostics and Design*, where they analyse a value chain together with the value chain actors and identify problems and gaps that they want to fill with some innovation: “*We don't have like a Bible to tell the actors [in the value chain], okay, this is what you need to do, or that is what you need to do, no. First of all, we sit down in a workshop we call Diagnostics and Design, where we co-create what the problems are in the value chain and how it fits with the approach of the program.*” (Interview, R6/2Scale). “*And the value chain that has been identified during the value chain analysis with all the actors in the value chain together with the 2scale program agrees that yes, we need innovations to bridge this gap.*” (Interview, R6/2Scale). After identifying the need 2Scale tries to come in contact with a potential new innovator and they have a meeting where they discuss the criteria, the project, and the characteristics of the innovator. Deciding based on the criteria can take between a few hours to five days. When the decision is made accepted innovators sign a contract to join the program, the contract can be for a shorter period (e.g., a year) or longer. GIIH on the other hand, has more steps. After the digital application during the twelve-day call, GIIH holds a pre-bootcamp with five days of training, two days of basic entrepreneurship training, and two days of pitching training. At the end of the pre-bootcamp innovators pitch for a jury of external judges that decide which teams are selected for the next bootcamp, which is also called “*the bootcamp for selection*” (Interview, R1/GIIH). At the second bootcamp innovators are trained for five days in design thinking and prototype development. At the end of the second bootcamp innovators pitch for an external jury again and are selected to join the incubation program. The innovators sign a contract for a six-month incubation period and officially become incubatees. This contract is renewable after six months, and when the six months have gone the incubatees are selected for a six-month acceleration period before they graduate the program. GIIH is just about to start its third cohort of incubatees. The last cohort (the second) started with 75 applicants attending the pre-bootcamp, 27 were selected to attend the second bootcamp, and 17 were selected to become incubatees. The third cohort started with 95 applicants attending the pre-bootcamp, and 26 were selected to attend the second bootcamp which took place on the 17th of April 2023.

Criteria: The two organisations have different goals and therefore have different criteria for which projects they select for their programs. However, they also have some criteria for

selection that are similar. The different criteria are too many to go into detail about, but a few important ones will be presented here. GIIH only accept groups of two to five students or alumni of the University of Rwanda, while 2Scale accept innovators from three categories. These three categories are lead firms (multinational firms), local SMEs, and farmer cooperatives. 2Scale works with three kinds of innovations, mechanical, digital, and good agronomical practices. 2Scale considers more criteria before they take an innovator into the program, and they make a distinction into two kinds of criteria, criteria on the innovator and on the innovation itself. *“On the one hand, I have the companies, the partners who are the drivers of the value chain in which we introduce this innovations where it best fit. And on the other hand, I will talk about the innovation themselves and in innovating companies or the innovators.”* (Interview, R6/2Scale). To join the 2Scale program innovators must fulfil three criteria; provide food directly or indirectly to Africans, their business model must have a direct line to smallholder farmers, and the food must be nutritious. These criteria are politically motivated and have to do with the mission of 2Scale. However, this is not a hard line for 2Scale as about half of their partnerships fulfil these criteria. *“Not all partnership has this, but about 50% I think of our partnership have connections to BOP [base-of-the-pyramid] products where we support the company”* (Interview, R6/2Scale). GIIH also have a politically motivated criterion, the business ideas should contribute to country priorities, for example, Rwanda’s Vision 2030 or Vision 2050. The two programs also have similarities in their criteria. Both programs look at the impact of the business idea and the team. The economic sustainability of the ideas is considered by both programs. *“We are looking at sustainability. Should we invest in this? And can it carry on beyond the life of the collaboration with 2Scale?”* (Interview, R6/2Scale). *“Is it sustainable? Will it make money in terms of economic sustainability? Look at the economic sustainability. Will it make profit, will it make money? And will it turn to an SME?”* (Interview, R2/GIIH). Both programs also consider scalability, but GIIH have stricter criteria for it, the business idea must be able to scale in 12 months (which is the duration of the full program). There are many more criteria for both programs. 2Scale states that their criteria are more like points of evaluation to guide a more informed decision, *“you must not score green in all these areas. You could be amber, you could be red”* (Interview, R6/2Scale)

4.1.2 Problems Faced by Incubatees and Support Given

The following paragraphs present the views of the managers. First, the structure of the programs. Secondly, what they report as challenges that incubatees face, then, what kind of

support is provided to the incubatees, both related to the challenges managers stated and challenges they didn't.

Structure: The two programs are structured quite differently, GIIH's support program is more like a university course, with a lot of focus on teaching and developing the entrepreneurs, while 2Scale's support program is more focused on the projects they are taking on. They do however have many similarities. The structure of the support programs is presented from selection to the programs until graduating (or leaving) the program. GIIH is presented first, and their program consists of two phases: six months of incubation and then six months of acceleration.

1. **Start of incubation phase | Contract.** The first step is to sign a six-month contract to join the incubation program. It contains the terms and conditions of the partnership between incubatees and GIIH, and the benefits of working with GIIH. *"It communicates the benefits/incentives be given as an incubate during the development of the solution from physical prototype to working prototype [...] that communicates what we give and what we don't give during the steps until they graduate the incubation period."* (Interview, R1/GIIH).
2. **Supervisor.** The second step is to assign an academic supervisor. The supervisors are matched with the projects unless they already have a supervisor from the university. The academic supervisors are the incubatees' closest contact (*"is the most available"*, Interview, R1/GIIH) and are technical mentors that do research in the same field as the project. *"The academic supervisor should be a researcher within that thematic area of a concept that you've submitted. For example, your concept is within the area of renewable. Then we look for a professor who is doing research in renewable to support the students developing the prototype before undergoing market validation."* (Interview, R1/GIIH). The supervisors help the project until the whole twelve-month program is finished and in each step on the way (including prototype development, market validation, and scaling up).
3. **Building prototypes and training.** Incubatees develop a prototype with the help of the supervisor. They get funding (called seed funding) to develop their prototype and do market validation. GIIH organises training in market validation, market testing and segmenting.

4. **Market validation plan and budget.** The incubatees decide segment, make a market validation plan and a budget for it: *“They come up with the budget, where they'll do the testing, and how best they can improve the product.”* (Interview, R2/GIIH). They submit them to GIIH and the accounting department.
5. **Pitch for the accountant.** The incubatees pitch for an accountant and the accountant department evaluates their plan and budget: *“All of them are requested to come and pitch in front of the accountant. They have to convince the accountant. Yes, but this is what we need.”* (Interview, R2/GIIH).
6. **Three-month market validation.** After getting their plans approved by the accountant department the incubatees start a market validation period in the field. The incubatees let users test their prototypes and get feedback, which is used to improve the prototypes. During this time GIIH is available to help and holds small training sessions (e.g., in intellectual property rights [IPR]). Some incubatee teams get an industry mentor during this period if the assigned academic supervisor can't help and the team need help with market validation: *“Sometimes we assign them people from the industry mostly where we need the expertise related to market validation, where the academic supervisor does not help, or the students does not have the prerequisite to do marketing validation.”* (Interview, R1/GIIH).
7. **Visits.** The Product Development Manager R2 and an accountant start to make visits, to see how the projects are going: *“Then we start visiting them. So mainly it's me and the accountant. We go and visit each and everyone and see how far they have gotten.”* (Interview, R2/GIIH)
8. **End of incubation phase | Market validation report.** Incubatees submit a market validation report to GIIH and graduate from the incubation program.
9. **Start of acceleration phase | Selection & grant.** There is a selection to the acceleration phase, and the projects are awarded startup capital, which is a grant to start and scale the business. The startup capital is given in instalments.
10. **Scaling.** The incubatees are developing their business and trying to scale to become viable businesses. To get the next instalment of the startup capital, they need to show their progress and what they need it for. During this time GIIH also provides additional help, for example, with contract negotiation and networking: *“Some of these who move to the level of startups, they have a problem of contract negotiation. We do it for them. And sometimes we do what we call the round table business*

networking with the industry and where they can strike a deal of with their outsiders. Those who want buy shares, those who want work with them. We open up a room for discussion of collaboration and cooperation around the process of entrepreneurship.” (Interview, R1/GIIH).

11. End of the acceleration phase | Graduation. The incubatees graduate from the program.

GIIH has a quite fixed structure for their program with a set length of time for the program and with periods scheduled for training and market validation. In contrast to this, the structure of 2Scale’s program is more designed around each project and the innovator, although it contains similar activities to GIIH’s program. After 2Scale has completed the value chain analysis and identified a gap in a value chain and gone through the criteria and found a suitable innovator the incubation program starts.

1. **Start of incubation | Supportive Partnership Agreement.** The innovator and what it needs is analysed, and a contract called a Supportive Partnership Agreement (SPA) is signed. This kind of agreement is short-term, around one year. The contract explains the project, states what 2Scale and the innovator will contribute to the deal, and commits the partners. R6 from 2Scale explained a bit about what a SPA can include: *“Let’s pilot your technologies here, how it goes, and then you take it to market from there within our network or our program, right? So we signed this, it binds you, it commits you to pilot this innovation, to reach 10,000 farmers, we need to spend, let’s say 50,000 euros, a hundred thousand euros in a year to do this. So how much are you bringing on the table, both in cash and kind? How much are we bringing on the table both in cash and kind, and what is your cash going to do? What is our cash going to do? [...] And it has strong commitment clauses within the documents.”* From this quote, it is clear that 2Scale has a more goal-oriented approach and can invest more in each project than GIIH can.
2. **Demonstrations.** At this stage, 2Scale helps organise demonstrations of the innovation. They use their networks to gather potential users (e.g., smallholder farmers) and facilitate opportunities for the innovator to showcase the innovation. R6 (2Scale) explains: *“We are going to pay for all that is needed to create the environment for the acceptance of your technology at the grassroots level. We bring the farmers. We pay*

for the demonstration, the field days, the field events, but we don't pay for the technology itself. You bring your technology, you demonstrate your technology, you provide services with your technology, you pay for your staff time and all that. And then we go to the field together.”. This quote shows that 2Scale (like GIIH) is involved in planning the market validation, but 2Scale also provides a network of users that can test the product.

3. **Tweaking the product.** If the innovation needs to be changed to better fit the value chain 2Scale helps and pays for that. *“But if the technology is going to be tweaked or redesigned to fit that value chain we can pay”* (Interview, R6/2Scale). 2Scale can, for example, pay for a software developer to come in and improve the software of the innovator’s product. 2Scale also helps with training, networking, and advice. 2Scale can help with getting licenses, permits, assessments, and connections to get third-party funding.
4. **Pilot.** The product is piloted within 2Scale’s network of potential users (e.g., smallholder farmers or base-of-the-pyramid consumers) for a fairly short period. *“Then you bring your technology, it is piloted within maybe one season or a few months, depending on the kind of technology.”* (Interview, R6/2Scale). The pilot is 2Scale’s version of what GIIH call market validation, but 2Scale doesn’t have a strict time limit for it, like GIIH’s three months dedicated to market validation.
5. **End of incubation | Pilot evaluation.** The pilot is evaluated, and challenges and successes are analysed. Any challenges are resolved if possible and the product might be changed.
6. **Scaling & Replication.** After potential challenges are resolved the scaling of the business starts. 2Scale withdraws from the project and lets the innovator scale the business: *“So at the moment of scaling, we are hands-off and let you handle your business because it is now a business for you.”* (Interview, R6/2Scale). The business is now in the hands of the innovator. This is different from GIIH, which has an acceleration phase where they fund and help the incubatees to scale their businesses. Another difference is that once this stage is reached 2Scale start doing similar projects elsewhere, R6 explains: *“We’ll begin to replicate in new programs or new partnerships or in new countries.”*. 2Scale starts to implement similar projects in similar value chains in other places.

This is the typical structure of 2Scale's program; however, it can surely be very different depending on the type of innovator. For example, an innovator with a small firm or a farmer cooperative need more help and resources from 2Scale, while a multinational firm needs less but might make more demands on the exclusivity of the idea (potentially stopping 2Scale from replicating projects elsewhere). Furthermore, replicating projects done with a multinational firm might be difficult without the capabilities of that firm.

Funding: Both incubators regard funding as a major challenge of the incubatees, but they handle funding differently. R1 from GIIH indicate that funding is an important challenge for innovators. To resolve this challenge GIIH gives some funding during the incubation phase and the acceleration phase of the program. R6 from 2Scale say that many innovators lack money for the working capital they need: *“Most of the innovators I’ve come across don't have enough working capital to take their products to market.”* (Interview, R6/2Scale).

At GIIH funding is given throughout the program. During the incubation phase of the program at GIIH the incubatees receive some funding to create their prototypes and do their market validation: *“We give them small funding so they can go out there and work on their prototype. [...] Maybe they'll go to a certain workshop and pay a small amount of money, which we have given them so they can make their prototype.”* (Interview, R2/GIIH). GIIH also helps with the application for and funding of intellectual property (IP). After the incubation phase, there is a selection again, and the ones selected for the acceleration phase receive what is called Startup Capital at GIIH. At GIIH the funding comes with limited strings attached, the incubatees need to follow through with the program but they are not expected to pay anything back in either phase: *“The investment doesn't come back to the university, it's purely a grant.”* (Interview, R2/GIIH). The grants are distributed between the incubatees and the projects with higher potential receive more: *“Like the first one [the startup awarded the most capital] won a grant of 10,000 USD and the last two won 1000 USD.”* (Interview, R2/GIIH). But these grants aren't given all at once, they are given in instalments and the incubates must show their progress and needs to receive the next instalment: *“We give them instalment, 30% first. And they show us what they've done with that 30% and how much sales they have generated and what they need the next instalment for.”* (Interview, R2/GIIH). GIIH furthermore help with funding by connecting incubatees with potential funders (more on this in the section on networking).

2Scale views funding differently which is clear from the following quote: *“The program itself is designed not to give subsidy. We don't give subsidy to actors. We facilitate change.”* (Interview, R6/2Scale). The quote highlights a difference between the two incubation programs. While GIIH gives grants and doesn't expect something in return (although incubatees must follow the program to get the next instalment) and the incubatees can buy most things they need with that money, 2Scale does not fund capital expenditure. Furthermore, 2Scale requires counter-performance and return on investment in the form of contribution to their goals of providing food security for Africans and the economic inclusion of smallholder farmers. Another significant difference between the two is that 2Scale tries to avoid giving cash, they instead try to contribute with their three main capabilities to partnerships: *“These are the three activities, brokering linkages, advisory services, and capacity building.”* (Interview, R6/2Scale). If a partner needs money to do something 2Scale prefers to contribute by doing what they do best, broker linkages with financial institutions (microfinance banks, deposit banks, or lending cooperatives) or by providing advice or training (capacity building) or help showcase products for potential users (e.g., smallholder farmers). R6 from 2Scale indicate that some investment can be risky for incubatees and 2Scale therefore can bear those costs, for example, by organising a showcase of a product with smallholder farmers. 2Scale can also pay for less risky investments sometimes if the innovator doesn't have the capacity and if it is a one-off cost:

If you don't have the skill, the time, or the manpower, we can pay for that as a one-off thing. So that software company, we will pay for their time. They work with you, upgrade your software, develop the software that is needed, or even develop a blueprint of how the technology should be used at the grassroots level. If you have not done the environmental impact assessment for that technology, we can bring you into the program until you have that certification and then we pay for those certifications, or we pay for those registration permits. We can work with the customs to enable you to do this business within Nigeria or broker that relationship.

Furthermore, 2Scale prefers to do projects that require their unique capabilities and help projects that can't be done by the other party without 2Scale: *“If you are already doing this in the value chain, what is that unique aspect that 2Scale has as a program? Because it makes no sense to spend taxpayers' money on a program where you can do by yourself, right?”* (Interview, R6/2Scale). This is also one of the selection criteria of 2Scale that they call

Additionality, one example of additionality is that 2Scale can use their networks to help innovators scale (more on that later).

Infrastructure: The two programs work with different kinds of innovators and therefore the infrastructure they need to supply is different. In the interviews with 2Scale infrastructure did not come up as a major issue of the innovators 2Scale work with. GIIH, however, regard infrastructure as one of the biggest challenges for their incubatees. The incubatees at GIIH need space and equipment to develop their prototypes, R2 from GIIH explains: *“Last year, the main challenge was space, makerspace where they can come and do their prototypes, create their prototypes, and equipment.”* R1 at GIIH agrees *“Working space and equipment, which are one of the basic needs of the innovators.”* The incubatees at GIIH have limited resources and funds and they need to develop their innovations on their own. Therefore, space and tools are crucial for them. The academic supervisors give access to laboratories at the university where the incubatees can develop their products, but these are busy, and tools are missing sometimes. GIIH provides an office called the incubation room where the incubatees can do business work and have internet access, however, internet access there can have its limitations R1 explains: *“Even the internet sometimes is not better as they need.”* To resolve these issues with space and tools GIIH provides funding which incubatees can use to go to workshops and develop their prototypes. However, GIIH is working on resolving this internal lack of infrastructure, they are building a makerspace with many capabilities like laboratories, workshops, space, and equipment the incubatees can use to build their prototypes and everything they need to create their businesses. The capabilities are planned for the makerspace, R2 from GIIH mentioned a few: *“We have different labs, electronic, mechanic, and prototyping lab. We have woodwork. [...] sewing, the tailoring part of it is. Sewing machines, and we have the dark room for social media, virtual reality. We also have space for training then we have a coffee shop in it. We have an outside space where they can sit and maybe brainstorm and for small meetings then also have the Co-working space for them.”* She also mentioned that the space is under development, but more capabilities are being added as other capabilities are being thought of. 2Scale does not provide infrastructure for its incubatees, but they do provide funding for some external parties to come in and improve products (e.g., software developer as aforementioned), which takes some of the need for infrastructure away.

Skills & Knowledge: Both the incubatees of GIIH and 2Scale often lack the skills and knowledge to make a product that fits the users and develops their businesses. Both R1 and R2 from GIIH indicate that getting industry knowledge is a challenge for incubatees. GIIH subcontract industry mentors to give knowledge to incubatees, R2 explains:

We need the industry mentors to tell innovators what really is out there, what problems they have. If maybe, they are students in energy. So, we expect those companies in energy to say what actually people need, the Rwandese or Africans or everyone need. This maybe clean energy or solar, but it is maybe other problem we haven't worked out really. And they come up with a solution or say, okay, we are working on this. Can this help? Can it support what you have? And then they exchange ideas. So basically, that's what we're looking for, is to tell them to, to assist them and know what is really out there. (Interview, R2/GIIH).

This quote shows the significance of industry mentors in the GIIH program, which stands in contrast to the limited use of them in the structure of the program as explained by the managers of GIIH. Most likely industry mentors are playing an important role in transferring industry knowledge to incubatees. But R2 at GIIH also state that industry mentors can be difficult to obtain: *“It's very hard to find them and to find time for the students [incubatees] as well. Because when you are in workshops, they pledge. But when you follow up, you find some are really busy and don't have time for the students [incubatees].”* (Interview, R2/GIIH). It is evident from this quote that the industry mentors are also holding workshops, not only helping the students that cannot be helped by their academic supervisors during market validation. The industry mentors are important but can be difficult to obtain and GIIH have trouble affording to contract the mentors, R1 said: *“We never had enough funding to subcontract the best mentors from within the ecosystem. [...] You cannot bring a big number of innovators when you don't have the big number of trainers and mentors and the space and the equipment and all that.”* (Interview, R1/GIIH). This quote point to a larger difficulty in funding the activities of Grid Innovation and Incubation Hub. However, GIIH is working to resolve this challenge: *“These were the challenges, which slowly we are resolving one by one.”* (Interview, R1/GIIH). The challenges referred to in this quote are funding (both to incubatees and GIIH), space and equipment, and industry mentors.

R6 from 2Scale also consider industry knowledge (or value chain knowledge) as a major challenge of 2Scale's incubatees. R6 gives an example: *“Some innovators don't have a clear*

picture of what is happening within certain value chains and how to design their productive services to fit those kind of value chains.” (Interview, R6/2Scale). The problem with this is that innovators don’t know their customers’ needs and without that knowledge, it is difficult to make an appropriate innovation. R6 further explains that the innovators that overlook industry and customer knowledge don’t consider the business case for their innovation:

Another problem they face is most times innovators design innovations to bring about change, right? To provide a solution to a problem. But they don't look at the business case. So you just develop a technology or develop a practice that is so complicated but you don't look at the business case. You don't look at who is going to be using this technology, how will they pay for it? Can it be sustainable? Can it go beyond me? And I just sit back and end from it. Why? It really solves the problem in the value chain, right? (Interview, R6/2Scale)

This is something that 2Scale can help provide directly because they have deep knowledge of smallholder farmers and base-of-the-pyramid consumers because of their strong networks and close collaborations with these groups. 2Scale can contribute these kinds of knowledge directly which stands in contrast to GIIH which contracts industry mentors, however, GIIH might be active in more different industries than 2Scale. As aforementioned 2Scale does three activities: advisory service, broker linkages, and capacity building. 2Scale has experts that provide industry and customer (or value chain) knowledge as part of the advisory service. Capacity building refers to training and coaching the incubatees. 2Scale provides training for the incubatees depending on their needs, internal and external. R6 gives an example of external business training: *“We connect them to some incubation hubs here in Nigeria who provide one-month long training on how to manage their business, how to seek for funds, how to do all of those things that makes them business driven.”* (Interview, R6/2Scale). This quote illustrates the example of what an innovator or a small firm might need, while a multinational firm most like does not need this kind of training. 2Scale also provides internal training (i.e., training given by employees from 2Scale). GIIH also provide training.

GIIH provides training in multiple areas. For example, basic entrepreneurship skills, pitching, design thinking, prototype development, market validation, and IPR. Applying for IP is still quite difficult for incubatees and GIIH facilitates (hire IP lawyers) and funds IP application for the incubatees. *“So what we do, we outsource them, we even pay them to facilitate the process*

of novelty description and drawing during the application of the patent or the corporate and trademark.” (Interview, R6/GIIH). This helps incubatees. Furthermore, GIIH helps incubatees in the acceleration phase with contract negotiations. *“By the way, some of them, even these who move to the level of startups, they have a problem of contract negotiation. We do it for them.”* (Interview, R1/GIIH). This surely is a help for incubatees, but it can also be problematic as one incubatees explains (more on that in section 4.2).

Networks/connections: Both incubators work with supplying networks to some degree, but for 2Scale it is one of their main capabilities. This is what 2Scale calls Brokering Linkages. 2Scale use its networks to help incubatees mainly with three things. Firstly, to gather potential users for demonstrations which can help scale innovations faster. As R6 puts it this helps create demand for the innovator’s product: *“They have this product and they need to create demand for it, because not many people are aware of their innovations, and if you don't know them, you can't use their service or their product, right?”* (Interview, R6/2Scale). This is one thing 2Scale can help with, furthermore, R6 from 2Scale gives an example of scaling a technology:

Does the collaboration with 2Scale allow the company to scale their innovation up to the level that you may not be able to achieve without collaborating with 2Scale within a short period of time? Like for instance, you want to scale your innovation to reach 10,000 farmers but you know realistically if you do this on your own, it'll take you 5-10 years before you get to this number. But if you're working with 2Scale, maybe this can be shortened to within one year, two years. (Interview, R6/2Scale)

2Scale has many farmers in their networks and brings them so they can use the technology. Secondly, connect incubatees with financial institutions like banks and microfinance (as mentioned in the section about funding). Thirdly, 2Scale shows their collaborations on their website as R6 explains:

Working with us creates visibility, because most of the time when these innovators work with the 2Scale program and we tell the stories within our website, they get a lot of business from other donor organizations who are interested in funding them in a way that we cannot, right? So that visibility we create for them enables them to overcome most of their challenges. (Interview, R6/2Scale).

This quote shows the visibility that 2Scale creates for its incubatees and how this visibility unlocks the networks of 2Scale, which gives benefits. GIIH helps their incubatees with networking by giving them access to networking events and workshops. For example:

Like last year they have attended quite a number of workshops. They participated in Africa Youth Connect Summit, which invites very many innovators and youth from African countries. And this time it took place in Kigali and they were able to attend for the three days. And the three startups exhibited, they were able to exhibit and connect with also other exhibitors and the youth who had come, they were able to connect with them. (Interview, R2/GIIH)

These workshops and events help incubatees practice pitching and help them build their own networks within their industries. GIIH also facilitate business networking events called Roundtable Business Networking events, R1 gives an example: *“Sometimes we do what we call the round table business networking with the industry and where they can strike a deal of with outsiders. Those who want buy shares, those who want work with them. So we open up a room for discussion of collaboration and cooperation around the process of entrepreneurship.”* (Interview, R1/GIIH). These events can help reduce the financial pressure by connecting incubatees with investors. The networking practices of the two incubators are quite different, but one thing they have in common is that they build trust for their innovators. 2Scale does that by making their collaborations visible, and GIIH does it by giving recommendations to potential business partners (more on GIIH’s recommendations in section 4.2).

4.2 Incubatees

In this sub-section, the findings from the interviews with incubatees are presented. Different themes from the interviews related to the research questions are presented. Experiences that add information about the hubs or contrast views of managers are particularly important.

4.2.1 Identification & Connection

In this sub-section, the findings based on interviews with incubatees related to the first research question are presented. Three sub-themes are considered with the overall theme of the research question, which relates to the identification of and connection with incubatees. These three themes are the application to the programs, the selection process, and the criteria considered to accept candidates. In the following paragraphs, the three themes are presented.

Application: The interviewed incubatees of GIIH did not have much to note about the application process. One incubatee mentioned that they had to provide information in an application document, which the managers also said. Another incubatee who has gone through and applied for other incubation programs said that it was easy to apply to GIIH, explains: *“Because like most of the time people with startups, when someone call for application, it is even very difficult to apply, most of them [applicants] are challenged by applying.”* (Interview, R4/GIIH). According to this incubatee, GIIH has an easy application process compared to other incubators.

Selection: The incubatees of GIIH only had positive experiences regarding the selection process to GIIH. One incubatee appreciated that all the applicants get training before selection, he said:

Like many of us, we have been selected and we start like receiving some trainings on how to improve our pitching, our project, our business plan. So we start going into it knowing what we are doing. Cause sometimes I'm in organic inputs, fertilizer, and pesticides. But for the first time when you apply, sometimes we say, okay, I'm in organic agriculture, I do agriculture, I do whatever, whatever. You don't know what exactly to present or to pitch. (Interview, R4/GIIH)

The incubatee is saying that the applicants have an idea, but it might be unpolished and applicants might lack presentation skills. The training teaches the applicants how to present and pitch, and how to improve their projects. This process helps pick out projects with high potential even if they are unpolished or the entrepreneur doesn't know how to pitch. The same incubatee said that GIIH's application and selection process is good, fair, and that it is the best he has experienced compared to other incubators' processes. Another incubatee reported that the criteria were very clear before the selection process, he said: *“The selection criteria were clear and they also sent the criteria before, therefore you can work on your project toward the criteria or specification they provided to you.”* (Interview, R5/GIIH). GIIH give the applicants the chance to improve their projects to fit the criteria before selection. This quote and the one above show that GIIH wants to give the applicants the chance to show the best sides of their projects. An incubatee reported that GIIH also uses external judges that are switched between the two selection points: *“And even they try to change the judges, therefore the judges who are*

in selection process, they may not come after the first selection. [...] And even the people who are there to select, they're coming from outside. They're not the part of and GRID, they're coming from outside." (Interview, R5s/GIIH). This makes the process less biased as the judges don't know the applicants.

Criteria: The interviewed incubatees from GIIH reported a few different criteria, which were mostly in line with the criteria the managers stated. One is that the applicant must have a team. Another criterion is that the applicant must be a student, alumni, or professor at the University of Rwanda. During the interviews, the managers did not mention that professors could apply to the program, the incubatee who stated this was in the second cohort (started in 2022) and said that no professors had applied at that time. A third criterion mentioned by an incubatee from the first cohort (started in 2019) is that the applicants needed to have a registered company before applying said: *"Their company should be registered in a legal institution in the country."* (Interview, R5/GIIH). This seems like a tough rule for many applicants to fulfil, however, the incubatee also said that this might have changed: *"Actually maybe there is change to the people who have not already registered their company, therefore they [GIIH] can facilitate them to register their [Incubatee's] company after joining the program. To have registered company maybe it's not part of it."* (Interview, R5/GIIH). This criterion might have been changed, but all incubatees seem to need to start a company. The last criteria that all interviewed incubatees mention were that the project must be a specific sort of project. One incubatee said that the projects must align with a national strategy, he said:

The project was supposed to be aligned with national strategy. These are some strategies that are at a higher level of our country. For example, where the country put in place some strategy against poverty which cuts across all sectors, agriculture, energy, biomass, cooking, health. So my project, basically, I thought it was aligned with the national strategy. (Interview, R3/GIIH).

This quote shows how one incubatee experienced the criterion that a manager at GIIH reported as a criterion of projects to align with country priorities (e.g., with Rwanda's Vision 2030 mentioned in section 4.1.1). Another incubatee said that the projects had to be in certain fields: *"The second one was like some projects, including energy, agriculture, or education."* (Interview, R4/GIIH). This quote probably hints at something like the quote before it, maybe projects in energy, agriculture, or education were contributing to the country's priorities. A

third incubatee said that the projects must respond to existing problems, he explains: *“I think the main condition to enter the program was about if your project is dealing with innovation and the innovation is responding to people's problem, mainly existing problem. Therefore, your project can really match within the value proposition.”* (Interview, R5/GIIH). The “existing problems” mentioned in the quote might refer to problems identified by the government and put into the political visions.

4.2.2 Problems Faced by Incubatees and Support Received

In this section, the findings from the interviewed incubatees related to problems faced and the support received are presented. Problems faced reported by incubatees are presented first, then the support they have received.

Structure: The incubatees of GIIH were not asked about their experiences with the structure of the program. However, one incubatee who has graduated from the full program said that GIIH is still helping him. R3 said that: *“This we can call it [we can call it graduated from the program], but they're still looking after. Still, they still monitoring you, monitoring how you are growing. They don't give up. You have to stay in the in their pipelines, agenda, program. They really keep following up.”* (Interview, R3/GIIH). R3 has graduated from both the incubation and acceleration phase, but he still receives some help from GIIH, he gives an example: *“They say we know this guy. He's someone we trained. He is our product, don't hesitate to cooperate with our product. Which is a very good support.”* (Interview, R3/GIIH). GIIH is helping this incubatee with recommendations to potential clients, which he appreciates.

Funding: All the interviewed incubatees of GIIH reported limited capital as a major problem for their projects. One graduated incubatee who is trying to scale his business now said that he is struggling to get funding from financial institutions: *“Another challenge is more related to the financial institutions, where it is a bit difficult to access to the financing.”* (Interview, R3/GIIH). The same incubatee said that he wanted that funding to invest in scaling and selling carbon credits, but he cannot afford it. All the incubatees have difficulties in scaling their businesses due to limited funding. One incubatee in the acceleration phase talked about inputs in his production of organic agriculture inputs: *“It's difficult to get the required inputs, the Rwanda government is supporting local farmers by providing subsidies in conventional*

agriculture inputs. But for organic they don't provide any support because they are no producers of organic inputs. So if we wanted to gain the market and to help farmers, we need to produce a lot of products." (Interview, R4/GIIH). The business most likely also needs to scale its production, but from this response, it seems like the demand for the product is big and the business could get going if it only could get the required inputs. Another graduated incubatee is trying to use the funding he has received efficiently but it is still not enough. He also said that the funding from GIIH is small and coming slowly and that he is worried about his idea being copied by competitors if he cannot scale fast enough. GIIH is aware of the funding being insufficient, a manager said: *"the funding, which is small and does not meet the demand"* (Interview, R1/GIIH). GIIH is trying to solve this by developing cash flows from the Innovation part of GIIH (which will work with translating research) and connecting incubatees with potential funders. The incubatee suggested that the problem of slowness might be coming from the connection between the incubator and the university. That is, the incubator must follow the rigid calendar of the university, the incubatee suggests that separating the two institutions might reduce this problem.

The incubatees of GIIH have received some financial support, for example, they mention, funding for prototyping and market validation and startup capital to start and scale the business. A graduated incubatee explains what he has used the startup capital for:

I managed from the fund they provided I bought some machines, some materials to be able to start to produce my first stock of cook stoves. And I had also to import some other materials, devices from abroad that I wanted to use to have a complete kit of stuff. And to be able to pay people, technicians who were manufacturing the cook stoves. And to buy some pellet to be sold, it was the startup funds. That's what I bought. And to rent a place where I'm manufacturing, I have a kind of workshop, a small place where I'm producing all of those cook stoves. (Interview, R3/GIIH).

This quote shows an example of what kinds of things the incubatees are using the received funding for. The same incubatee also mentioned that he had received training in business and soft skills (e.g., pitching), which helps him to do fundraising. Another incubatee use the startup capital to buy land which he needed for his project. However, this was problematic as it is not within the university's mandate to buy land. This was a difficult process for the incubatee, and he thinks that GIIH should be disconnected from the mandates of the university. The incubatees

gave some more feedback to the incubation program. One incubatee who has gone through multiple different incubation programs said that it is very good that GIIH gives both funding and training, which not all programs do. He also appreciated the follow-ups on how startup capital is used. He indicated that this makes incubatees spend their money wisely and helps them achieve their goals, and he said incubators should do follow-ups even a few years after graduation from the program. He also mentioned that incubators need to understand the incubatees' needs and give an example from another incubator. At the other incubator, the program finished with a 5000 USD (per incubatee) trip to China to learn from startups there. However, when they came back home and left the program, they didn't have the resources they needed to carry on their businesses and most of them failed. Those 5000 USD could have been invested in giving the incubatees the equipment they needed, like laptops and offices. Another incubatee gave the feedback that GIIH should invest in more incubatees, but he also said that he didn't know if they could afford it.

Infrastructure: The three interviewed incubatees of GIIH all mentioned that they got access to an office at the hub when they joined the program. It is sometimes called the incubation room; it has internet access and the incubatees can sit there and work. One incubatee currently in the acceleration phase said that he is allowed to go there anytime he wants to. Incubatees can receive funding to buy or rent space. One incubatee rents a workshop where he produces his products. Another incubatee didn't have much use of the provided office as he was based outside Kigali, but he received funding to buy land for his project (mentioned above). One incubatee said that if GIIH had a laboratory it would benefit incubatees:

The common asking and we believe they told us it will be available, is to have a laboratory. If the incubator have their own laboratory, everything is researched there. It'll help us and the future incubatees who will come. Because like most of the project are energy projects, agriculture. So we need something like to start with. We need to do research, we need those tests. We need those prototype. So when we go out to pay for it cost a lot. (Interview, R4/GIIH).

This statement shows that it has been difficult for incubatees in technical projects to access labs and make their prototypes.

Skills & Knowledge: All the interviewed incubatees from GIIH reported lacking some kind of skills or knowledge, for example, business skills and technical skills. Business/soft skills mentioned by the incubatees include pitching, presenting, PowerPoint, making business plans, project management, entrepreneurship, how to start and register a company, how to apply for funding, and how to organise. Technical skills mentioned include research, market validation and prototyping. One graduated incubatee said he still needs to acquire more skills to compete in the market going forward. Another incubatee explained an important teaching aspect of incubators: *“It is a kind of teaching centers, for example, they tried to teach things that we didn't get in school, but which are really important to the person who want to engage in any project implementation or any project formation.”* (Interview, R5/GIIH). This quote shows that university graduates usually don't have the necessary training to start a business as some skills are overlooked by schools. All incubatee mentioned that they receive(d) mentoring and coaching from the academic supervisors. The supervisors seem to be an important way for the incubatees to get knowledge and skills besides the training sessions at the incubator. One incubatee explains who the academic supervisors are: *“We have been connected to mentors [academic supervisors]. They are professors who have made some research about the product. With the mentors, it's very easy to be guided on how we can test our products.”* (Interview, R4/GIIH). In this quote, the incubatee also explains how the academic supervisor helps him with market validation. Another incubatee gave some examples of things his supervisor has helped him with:

That person helped us very much because he is like a consultant to us. We drafted things and shared with him and see if it is clear if we are going to submit anywhere. So the people is going to see that stuff if it truly contained something. So actually that person helped us in terms of ideation, specifically, to understand us, to try to figure out what we want to achieve. He is in that and even now we still work together with him where he supported us through the implementation and different legal management. We don't know about it. (Interview, R3/GIIH)

This quote shows that the academic supervisors are helping with both technical matters (e.g., ideation) and business/soft skills (e.g., presentation). The same incubatee explained how GIIH is helping him improve his idea:

Basically, it was throughout the challenges. Whenever you come up with an idea the only thing to improve the way you were thinking it is that those challenges that you received from them. Throughout the challenge, they say, “did you think about

this? Did you know that?” It is a challenge in terms of making you think wiser, like telling you “That you thought this, but it can't work like this. As of today, what is on the ground? Please, you have to do the market research, go on the market, see what the people are thinking.” (Interview, R3/GIIH).

The quote shows that GIIH is giving feedback on prototypes and posing critical questions that help incubatees improve their products. Another thing GIIH helps with is obtaining important market information/knowledge. One incubatee mentioned that databases are quite advanced in Rwanda and that GIIH helped him access a database on deforestation. With this information he could find a local market that would benefit from his product, hence giving an ideal customer segment to start with.

Networks/connections: None of the interviewed incubatees from GIIH stated that getting access to networks was a challenge for them. But two of the incubatees said that it is something that GIIH is contributing with. One graduated incubatee recalls: *“I remember we used to have exhibitions where we had some stand to showcase our products, and therefore we would meet different potential stakeholders.”* (Interview, R3/GIIH). GIIH gave incubatees opportunities to exhibit products and meet stakeholders. The same incubatee also mentioned that a few other incubatees visited other incubators in Europe. Another incubatees shares this view, he explains: *“They help to be connected to different people, institution, where we attend different showcasing, exhibitions, and meetings. I think through networking, we are now together talking about what we do, the challenge we are facing, while we also network.”* (Interview, R5/GIIH). This incubatee agrees but he also stated that the networks haven't given a clear contribution yet:

So far through networking there is no like clear contribution. But I hope in the future when we have enough production and we want to have like a big market, we have those connections to the people who are interested to buy, to help us, or to connect us to the global market. So I think in the future it's going to contribute. (Interview, R5/GIIH)

Although it might not have helped him yet, he thinks it will help in the future. One graduated incubatee said that he got help with recommendations to potential clients (mentioned above in this section). He explains how the recommendations have helped him:

But in this process Grid [GIIH] was paying the transportation, they were providing the letter of recommendation to the local leaders so they see me as somebody who is coming from an organised institution. It is the facilitation market penetration facilitation. So wherever I wanted to go I was getting everything and doors are open to me. I never faced any challenge. (Interview, R3/GIIH).

Although he didn't mention the lack of networks as a challenge when asked he is benefitting a lot from the access the networks and the reputation of GIIH is giving him. The same incubatee highlighted the importance for startups to network within the industry: "*It is better to network with other companies that are doing similar products. Know where they didn't touch and make sure that you are filling the gap.*" (Interview, R3/GIIH). What is meant here is that entrepreneurs should network within the industry to learn what other firms are not doing (i.e., find the gap) and do that (i.e., fill that gap) to differentiate against competitors. One incubatee appreciated the diversity of projects at the incubator: "*So from those different projects, when we are together, we can exchange our experiences, our difficulties, because they are the diversity of projects.*" (Interview, R4/GIIH). He appreciates the opportunity to learn from his peers, and another incubatee said sharing personal experiences have some value for other entrepreneurs:

It is somehow like an inspiration to other entrepreneurs who want to do it. For example, if I meet with someone and tell him: "I pass through this incubator, that's why you see me like as I am today. So you should also try." And that is kind of inspiration if there is institution like them [GIIH] who support the young entrepreneurs like me. It is kind of inspiration to other people, to other young who want to do something for their own, for their country, and for their community. (Interview, R5/GIIH)

He is saying that sharing personal experiences and institutions like GIIH inspire entrepreneurs to try their ideas.

5 Discussion

In this section, the findings from the interviews are summarised and presented. Then the findings related to the first research question are discussed through the lens of the reviewed literature. Then the same is done for the findings related to the second research question.

5.1 Summary of the Findings

In this section, a summary of the findings from the interviews is presented. The table below summarises the most important findings from managers and incubatees from the two organisations. The table also contrasts the findings between managers and incubatees. The darker cells refer to findings related to GIIH, and the white cells refer to findings related to 2Scale.

Topic	Managers	Incubatees	Contrast GIIH Manager/Incubatee
Application	12-day application window. Opens when there is a big number of “ <i>doable concepts</i> ”.	Easy application process.	No significant difference.
	Both seeking innovators and being sought out. Usually starts by identifying a gap in a value chain in a value chain analysis. 2Scale have used their networks, adverts, and contests to find innovators and innovations.		
Selection	External judges. Steps: 1. 5-day pre-bootcamp training in entrepreneurship and pitching. 2. 5-day bootcamp training in design thinking and prototype development. 3. Sign contract.	Trainings before selection helps incubatees show the best of their ideas. Clear criteria. External judges.	No significant difference, but the trainings before selection are appreciated by incubatees.
	Steps: 1. Value chain analysis with stakeholders. 2. Find innovator. 3. Meeting to discuss criteria. 4. Decision can take up to 5 days. 5. Sign contract.		

Criteria	<p>Student or alumni of the university. Team, 2-5 members. Align with country priorities (e.g., Vision 2030). Sustainability and scalability (scale in 12 months). Criteria are stricter.</p>	<p>Student, alumni, or professor from the university. Must have a team. Have a registered firm (maybe not). Align with national strategy.</p>	<p>Professors can apply. Maybe must have a registered firm before application.</p>
	<p>Accepts SMEs, farmer cooperatives, or multinational firms. 2 kinds of criteria: innovator-criteria & innovation-criteria. Fit with the program: 1. African food security, 2. Connect with smallholder farmers, 3. Nutritious food. 50% of incubatees fulfil these 3 criteria. Sustainability & scalability. Criteria guide the decision.</p>		
Structure	<p>More focus on teaching and developing entrepreneurs. Academic supervisors. Important steps: Incubation phase (developing the prototype, training in market validation, making a validation plan and budget, 3-month validation, report) and Acceleration phase (selection, grant, scaling business).</p>	<p>GIIH help graduated incubatee with recommendations.</p>	<p>GIIH help graduated incubatee with recommendations.</p>
	<p>More focus on projects and deals. Important steps: Incubation phase (demonstrations with farmers, tweak the product, pilot, evaluation) and Acceleration phase (tweak again, scaling without 2Scale, 2Scale replicates elsewhere).</p>		
Funding	<p>Grants. Funding for prototype & market validation, and startup capital in instalments for scaling.</p>	<p>Need more funding for scaling and inputs.</p>	<p>Startup capital is insufficient, but management is working to fix this.</p>

	<p>Startup capital varying amounts depending on potential, and in instalments (first 30%). Funds IP.</p>	<p>Difficult to get funding from institutions (but pitching skills help). Capital is too small and coming too slow. Difficulty funding somethings (e.g., land purchase). Follow-ups ensure the money is used wisely.</p>	<p>Pitching trainings help do fundraising. University mandates can make things difficult for incubatees. Follow-ups ensure the money is used wisely.</p>
	<p>“No subsidies” (counter-performance expected). Not funding capital expenditures. Prefers to invest with 2Scale capabilities (instead of cash). Broker linkages with financial institutions. Funds incubatees risky investments (e.g., demonstrations). Funds if products need to be changed.</p>		
Infrastructure	<p>Free office (24h access) with internet. Some access to labs with tools. Funding for external space/workshops. Building a makerspace with labs and tools.</p>	<p>Free office (24h access) with internet. Some access to labs. Funding for external space/workshops. Need labs.</p>	<p>No significant difference, but the makerspace is needed.</p>
	<p>Not a big issue. Funds external parties to tweak products, reduces need for infrastructure.</p>		
Skills/ knowledge	<p>GIIH give training in business/soft skills & technical skills (e.g., pitching, entrepreneurship, prototyping, market validation). Academic supervisors help. Industry knowledge needed to make a good product, industry mentors supply this. Industry mentors’ importance might be understated.</p>	<p>Limited business/soft & technical skills, GIIH give trainings. Academic supervisors help. GIIH challenge thinking & prototypes. Access to information (e.g., database).</p>	<p>No significant difference.</p>
	<p>Industry/value-chain knowledge is a big challenge and 2Scale provides it. 2Scale can give internal & external training to incubatees.</p>		

Networking	Events, workshops, exhibiting, showcasing. Roundtable Business Networking events connect incubatees with industry and funders.	Not a major challenge. Exhibits, showcasing, and meetings help meet stakeholders and peers. No clear contribution yet. Recommendations help get customers.	Maybe different views on contribution of networking. Recommendations are appreciated.
	1 of 2Scale's strengths: "Brokering linkages". Sets up demonstrations with potential users. Connects incubatees with funders. Creates visibility for incubatees, which attracts funders.		

Table 2: This table summarises the key findings of the interviews. The darker cells refer to respondents from GIIH, while the white cells refer to managers from 2Scale. The findings of GIIH managers and incubatees are contrasted on the utmost right side of the table. Source: developed by the author.

In the following two sections, the findings and research questions will be discussed through the lens of literature, and the insight related to managers and incubatees will be merged.

5.2 Identification & Connection

How incubators identify and connect with innovators is the subject of the first research question of this thesis, which is: *How are innovation hubs identifying and connecting with grassroots innovators?* To answer this question interviews have been conducted and analysed. From the analysis three themes of identification and connection with innovators were identified, application to the incubator program (or connecting with innovators), selection of applications, and criteria to accept applicants. A framework showing coding, thematic analysis, first-order concepts, second-order concepts, and the aggregated construct related to this research question is available in Appendix 1.

Before the findings are analysed a discussion about whether the practices at the two innovation hubs are currently leading to innovation at the grassroots level is in place. 2Scale's program creates innovations that help base-of-the-pyramid-consumers and smallholder farmers and

creates work for and empowers those value chain actors (e.g., for unemployed women in Nigeria). The innovations are initiated (i.e., the gap is identified) by the actors in those value chains. The innovations can be incremental but have a big impact in the context (e.g., starting rice processing in Nigeria, which creates many jobs). The fact that some of 2Scale's innovators are farmer cooperatives is a strong argument for that grassroots innovation is occurring at 2Scale.

Grassroots innovation is also occurring within the incubation programs of GIIH. Most of the incubatees at GIIH are from smaller communities outside Kigali, and their products are helping people at the grassroots level. The incubatees are market validating and testing prototypes with people at the grassroots level, but they and their team members are leading the development of the products. The incubatees and their teams are highly educated and likely have more resources than people at the grassroots level. However, many of the successful teams from GIIH are solving local problems in their communities outside Kigali. Many of them deploy their innovations in their local communities that they or people they know certainly have experienced. This suggests that significant grassroots innovation might already be going on at GRID, although maybe not the more traditional grassroots innovation done by groups or movements from the toughest conditions in the context. But it is still grassroots innovation because innovation for your community can be seen as grassroots innovation (UNDP Accelerator Labs, 2020). Cherunya and Ahlborg (2020) stated that grassroots innovations are perceived to have a higher chance of success, this might be true as most of the innovations at GIIH are grassroots innovations. That is, they have survived better than projects that aren't grassroots innovations. Another explanation might be that these innovations are "*low-hanging fruit*" and therefore are perceived to have a higher chance of reaching financial sustainability and success and therefore are selected in the selection process. The selected projects are required to fit with country priorities, like Rwanda's Vision 2030 and Vision 2050. These have goals like reducing poverty among others. This requirement might be a leading factor in promoting more grassroots innovation at GIIH.

5.2.1 Application

GIIH have a traditional application process while 2Scale use different methods. GIIH opens a call, innovators apply and then selection starts. This process seems to work well, as many

innovators apply each year. The online application form poses critical questions about the projects, making innovators think and priming them for the selection process. Furthermore, the application process is quite straightforward, one interviewed incubatee said that the application process was easy and that at other incubators even applying can be a challenge. 2Scale has used many methods to find innovators, for example, open applications, advertising, searching for innovations elsewhere that could be replicated to solve the problem, and doing innovation contests. Using different methods to find innovations and innovators gives 2Scale flexibility to consider what each situation requires, for example, a difficult problem might require a solution with demonstrated feasibility then the lead user method is appropriate, or a small less technical problem might require a fast solution then innovation contests are appropriate (Goeldner et al., 2017). Innovation contests and the lead user methods can be effective for institutions like 2Scale that identify problems and look for solutions. However, they aren't relevant for organisations like GIIH which don't drive innovations, GIIH does not initiate any projects or look for solutions to specific problems. GIIH train and support innovators to do their projects.

5.2.2 Selection

The selection processes of the two organisations are different. GIIH has bootcamps, trainings, and selection rounds with external judges and many applicants. While 2Scale identify a gap and looks for a solution. In this sense, 2Scale works more like a private equity firm focusing more on single projects and deals. GIIH's selection process seems to be appreciated by incubatees. Incubatees reported that the criteria for admission were clear and sent out before selection and that judges were external and switched between selections. Incubatees also appreciated the training given during the bootcamps, it teaches them what to present and how to present in a good way. GIIH's process reduces bias in selection and ensures that innovators with low skills in presenting can get their message across. 2Scale's methods most likely aren't appropriate for GIIH due to the role of GIIH as a trainer and supporter of innovators (discussed above).

5.2.3 Criteria

Both organisations consider many criteria when selecting innovators to work with, although innovators don't have to fulfil them all to be selected, and some of these criteria can be related to the reviewed literature. Hossain (2018) identified extrinsic challenges, these are

geographical rootedness, context specificity, and ideological commitment. Both GIIH and 2Scale consider how the innovations will fit the contexts they will be placed in. Furthermore, both consider the commitment of the teams of innovators that are being considered. Commitment is important to reduce the challenge of team turnover (i.e., losing key people), an intrinsic challenge identified by Hossain (2018) and Seyfang and Smith (2007). A manager of 2Scale said that they consider the entrepreneurial spirit of innovators. Meaning that 2Scale tries to gauge if the innovators are committed to creating real impact in the context or if they are only trying to make a quick deal and move on (e.g., dump a technology). GIIH want the teams of incubatees to be mixed and passionate (i.e., committed) about their projects. The problem with key people leaving is that many grassroots teams lack institutional learning, which is also suggested in literature (Seyfang & Smith, 2007). This means that the team members hold a lot of important tacit knowledge, which is lost if a team member leaves. Contracts are also used to ensure commitment and hence reduce knowledge losses. 2Scale uses a contract with strong commitment clauses to make sure the innovators are committed. GIIH provide teams with a team member agreement contract to make sure the team members have realistic expectations about the project they are considering doing. Furthermore, GIIH recommends applicants choose their team carefully. Smith and Stirling (2018) suggest that projects that don't follow a commercial logic have more difficulties getting funding. Projects dealing with social problems follow commercial logic less often. One reason why it is more difficult to fund them is that return on investment in them can be low. Such projects might need public funding or grants to be viable. However, GIIH has a strict criterion of not accepting any projects that deal with social problems even though they give grants. If GIIH has the capabilities to help some such projects this exclusion might be a missed opportunity for GIIH to make a big contribution to society. Another criterion 2Scale uses relates to what kind of innovation the project is about, mechanical, digital, and good agronomical practices. Bernstein et al. (2021) noted the important role of innovation hubs they analysed in sharing emerging practices. This is the same thing that 2Scale is doing when they share agronomical practices.

5.2.4 Summary and Answer

How a university-embedded innovation hub like Grid Innovation and Incubation Hub can identify and connect with grassroots innovators is a difficult question. One way is to do it in the way that GIIH is currently doing it as previously presented and discussed, but is that the optimal way? It depends on the goals and the role of the hub. When it comes to application (or

getting in touch with innovators) the open application format which GIIH is currently using is probably the best of the discussed options for GIIH and other university-embedded innovation hubs due to the role and different goals identified in the interviews. They also have some nice features in their application process already with the easy application form that primes the applicants with critical questions. In the selection process, the role of the hub is important. If a hub has more of a supporting role (like GIIH) than an innovation-driving role, then a selection process like GIIH's is more appropriate. The selection process of GIIH also has some nice features, external judges that are switched between selection rounds to reduce bias in selection. Training provided before selection guides applicants in what they should present and how to show the most important sides of their projects. 2Scale however, identify the problem to be solved and find an innovator to do it. Identifying the gap before developing the product ensures there is demand, which leads to a higher chance of success. GIIH also provide clear criteria for selection which are sent out before selection, this also guides applicants in what they should present. 2Scale has more and partly different criteria for selection compared to GIIH. This is because the two hubs are in different fields and support different kinds of innovators. The criteria that GIIH use could be appropriate for similar university-embedded innovation hubs in their selection processes with some minor adjustments for the field they are in. These answers assume that the potential university-embedded innovation hub has a similar role and goals as GIIH does. If a university-embedded innovation hub wants to support broader grassroots innovation, it should also consider accepting projects based on social problems into its programs. This would give a large impact as such projects have difficulties gaining funding as they typically don't follow commercial logic and have low returns on investment.

The organisations are more different than expected. 2Scale work more like a private equity firm driving individual innovation projects, which is different from GIIH's current program. GIIH's program is more like a startup course taking in many applicants at a time. Other university-embedded hubs could use a similar approach as GIIH or try 2Scale's private equity-like approach. 2Scale's approach is more difficult and expensive, but it seems to be a more effective strategy, however, it might not align with university mandates. University mandates have been identified as a challenge to the management of the hub for GIIH. However, maybe going for an approach like 2Scale's could work well for university-embedded innovation hubs that want to have a more active deciding role in which problems are solved. It does however mean supporting fewer projects at a time, which potentially reduces the impact of the hub. If

challenges with funding and scaling can be solved by collaborating with other supporting institutions, then an approach like GIIH's might be more impactful. But if they cannot be solved, then an approach like 2Scale's or reducing the number of incubatees might be more effective. However, the 2Scale approach requires stronger networks in different fields and having the mandate from the university to do it. If university-embedded innovation hubs want to give broader support to grassroots innovation, they could skip the criteria for being students or alumni and having a formal education, and they could also consider bringing their support to rural areas.

5.3 Challenges & Support

How incubators can support innovators is the subject of the second research question of this thesis, which is: *How can university-embedded innovation hubs support grassroots innovators in their efforts?* To answer this question interviews have been conducted and analysed. From the analysis five themes of support to innovators were identified, structure of the incubation programs, funding of innovators, infrastructure provided, skills/knowledge/training provided, and networking. A framework showing coding, thematic analysis, first-order concepts, second-order concepts, and the aggregated construct related to this research question is available in Appendix 2.

5.3.1 Structure

What structure the support of grassroots innovators should take is not discussed in the reviewed literature. But the three-phased framework of Dana et al. (2021) can give some inspiration on how the support roughly could be structured. The three phases are the inception phase, the protective niche phase, and the open market phase. A program that follows these three phases would first focus on validating the problem and that the solution is appropriate, then create a prototype and have a small segment of potential users test it, and lastly when the prototype is finished scaling the business to start selling on the open market. The framework offers some questions to pose in the different phases and Dana et al. (2021) recommend that the community that will use the innovation should be involved in each phase (i.e., design thinking).

The incubation program of GIIH is following a structure resembling the three-phased framework. First (inception phase), incubatees validate the problem by conducting interviews with people experiencing the identified problem. Second (protective niche phase), incubatees create prototypes (they might already have one) which are tested by potential users (so-called *early adopters*, which are people experiencing the problems). Feedback is collected and the prototype is improved, and the users test the new prototype (this process is called rapid prototyping). Lastly (open market phase), when the product is finalised incubatees get startup capital and start to scale their businesses to reach the open market. GIIH is connecting their incubatees with the local communities during the development (i.e., problem validation interviews and prototype testing) of the product as recommended by Dana et al. (2021). GIIH also provide some skills that help incubatees to connect their development to the community (i.e., design thinking and agile development). However, the scaling/acceleration phase of GIIH's program is not working as intended. Many incubatees are experiencing big problems taking their products to market. What is causing this is difficult to know. The interviewed incubatees all state that they need more funding, this is one potential challenge that might be stopping them from scaling their businesses, for example, scaling production fast is difficult if you cannot afford the required machines. Another potential reason could be a lack of business skills and a lack of understanding of market dynamics, which the third phase of the framework focuses on. GIIH provides training in some business skills, but as reported by a manager the incubatees are graduated from the program before becoming business and investment ready. This is because these are not the specialities of the people helping/training the incubatees. One option to resolve this is to make the program longer and get trainers that can help. Another option that GIIH is trying to deal with this issue GIIH is connecting with independent private hubs that can do mentorship for market readiness, help with market validation, support, and fund incubatees. GIIH is trying to create a more holistic support system for incubatees, where they can be incubatees at GIIH and then be connected with or transferred to independent innovation hubs for scaling up. GIIH is working on developing a system of triple helix support, meaning support from the university, private sector, and government.

The support program of 2Scale is a bit different from GIIH's but still follows the three phases. Typically, in the inception phase 2Scale start by doing a value chain analysis with the value chain actors (i.e., the potential users) to identify a problem that needs solving in the value chain. This is a significant difference between GIIH and 2Scale. At GIIH an innovator tries to figure

out what the users need, and with 2Scale the users figure out what they need and tell an innovator. This creates demand before the product is developed, which seems to contribute to the success of the developed products. This is possible due to 2Scale's strong networks with potential users, GIIH might want to do this, but it would likely be difficult because they don't have the same kind of networks with users as 2Scale has. In the protective niche phase, 2Scale finds an innovator and helps them test (demonstrate) their prototypes with potential users and pilot them. 2Scale help improve the prototype and when it is finalised scaling starts. In the open market phase, 2Scale exits the project and lets the innovator scale the business on their own. However, 2Scale starts replicating similar projects in similar value chains with other innovators. 2Scale doesn't help incubatees scale but they replicate projects to make sure other potential users are benefitted, it is a little bit like scaling.

5.3.2 Funding

Limited capital, funding and investment have been identified as a challenge for grassroots innovators by many of the reviewed authors (Seyfang & Smith, 2007; Seyfang & Haxeltine, 2011; Hossain, 2018; Smith & Stirling, 2018; Bernstein et al., 2021) and Bernstein et al. (2021) call financial support a key enabler of grassroots innovation. Seyfang & Smith (2007) identified two ways to fund the scaling of a business, these ways are bootstrapping or public funding (i.e., grants). 2Scale exits when scaling starts. GIIH on the other hand gives startup capital (public funding) in instalments when incubatees are scaling their businesses. This funding is however limited and doesn't meet the demand of incubatees according to both managers and incubatees. Furthermore, as one incubatee stated, when it comes to funding GIIH doesn't follow the incubatees' needs, they follow their plans. Meaning that incubatees don't get the funding that they need when they need it. Most likely this is due to the internal funding problems of GIIH, which they are working on solving. Nevertheless, the funding situation at GIIH now seems to resemble the findings of Seyfang and Smith (2007) who state that funding frameworks often are imposed on grassroots innovators rather than responding to their needs.

Connecting innovators with funding institutions (which 2Scale is doing), for example, micro-financing or other hubs that can fund (which GIIH is doing) can help alleviate funding challenges. Bernstein et al. (2021) recommend that hubs that are supporting innovators should facilitate access to financial resources by acting as guarantors for private loans and by receiving

and distributing grants. 2Scale does not distribute grants, but they do help access private loans by anticipating revenues. 2Scale does this by giving incubatees access to the markets of farmers they have in their network, and this helps incubatees obtain financing. GIIH doesn't act as a guarantor for private loans, but they distribute grants. GIIH incubatees have big problems getting funding, and if GIIH could act as a guarantor this challenge would be reduced. However, this is probably not an option for GIIH as doing that would put the limited funding they have at risk, and it might not be within the mandate of the university.

5.3.3 Infrastructure

Bernstein et al. (2021) and Smith and Stirling (2018) identify infrastructure as a challenge to grassroots innovation and providing infrastructure as a way to support grassroots innovation. Managers at 2Scale don't seem to think that infrastructure is a big challenge for their innovators, this could be because of 2Scale's incubatees typically have more resources than the incubatees of GIIH. The incubatees are SMEs, multinational firms, or farmer cooperatives (where each farmer owns a piece of land). The incubatees already have space, equipment, and maybe some tools or machinery, which could be needed for development. Furthermore, 2Scale takes some infrastructure needs of the incubatees when they pay third parties to develop or tweak the prototypes. The incubatees of GIIH on the other hand must do the development of their prototypes themselves, which requires space to work and equipment. The academic supervisors provide some access to space and equipment and GIIH provides some funding to use external workshops and an office. The provided infrastructure does have some problems, for example, the labs are busy and the internet access in the office is limited. GIIH is building a makerspace with all the infrastructure that incubatees need (including improved internet access) to improve the infrastructure provided. This is in line with the findings of Bernstein et al. (2021), who state that providing communication and promotional facilities is a key enabler of grassroots innovation. However, the makerspace is in Kigali and many incubatees are from outside Kigali and make innovations that target their local communities. Many incubatees will likely be able to travel to Kigali to improve their prototypes, but GIIH will still need to give some seed funding to incubatees so they can rent workshops close to their local communities. If some incubatees seldom use the makerspace an opportunity is opened. Smith and Stirling (2018) suggest that innovation-related facilities (like the makerspace) should be more open to boost broader grassroots innovation. GIIH could open the makerspace for the public. This

would boost grassroots innovation and could contribute to a more entrepreneurial and innovative culture in Kigali.

5.3.4 Skills, Knowledge, and Training

Like many of the reviewed articles, both GIIH and 2Scale identify a lack of skills/training/knowledge as a significant challenge for innovators (Seyfang & Smith, 2007; Hossain, 2018; Smith & Stirling, 2018; Jones et al., 2019; Bernstein et al., 2021). Managerial and entrepreneurial skills are specifically highlighted in two articles (Jones et al., 2019; Bernstein et al., 2021). GIIH provide entrepreneurial skills and business/soft skills, but there doesn't seem to be much managerial skills training offered. An incubatee from GIIH reported that they learned valuable business skills like professionalism, organising, and pitching for funding. Even still incubatees are not ready for business and investment when they graduate from the program. GIIH is working on this issue. Hossain (2018) states that innovators need help with conducting research, which both GIIH and 2Scale support with. 2Scale also support its innovators with training. Both GIIH and 2Scale support their innovators with industry knowledge, which is important to create appropriate products.

Diffusion is a challenge for many grassroots projects (Seyfang & Smith, 2007; Smith et al., 2014; Hossain, 2018; Dana et al., 2021). Understanding diffusion could make scaling a business easier for innovators, and a limited understanding of it might partially explain the difficulties experienced by GIIH incubatees. GIIH should consider providing training to incubatees on the topic. The OECD's five critical factors for diffusion discussed in 2.2.1 could be used to guide the projects in this aspect.

The topic of intellectual property rights is complex, and so is intellectual property protection application. GIIH provide some training in intellectual property rights and helps incubatees with applications. This support aligns with the views of Hossain (2018) who suggests that innovators need support with protecting intellectual property. However, Bernstein et al. (2021) do not agree, they state that intellectual property protection doesn't seem to be important for grassroots projects. If intellectual property protection is important for a project or not depends on the project. For highly technical more business-oriented projects like the ones at GIIH

intellectual property protection can be important. While the projects at 2Scale might benefit less from intellectual property protection.

If GIIH wants to support grassroots innovation on a broader level, they could provide training lectures to a broader audience (Smith & Stirling, 2018). Bernstein et al. (2021) state that grassroots innovators seek managerial and entrepreneurial skills outside the formal education system. They also recommend that innovation hubs that want to support innovators should design and offer professional training programmes. Starting such programmes and doing lectures would help innovators and could be a potential revenue source for GIIH.

5.3.5 Networking

Establishing networks and connections, and finding all necessary stakeholders and partners is a challenge for innovators (Seyfang & Smith, 2007; Seyfang & Haxeltine 2011). Both GIIH and 2Scale help with this, but GIIH is experiencing more difficulties. The incubatees of GIIH are facing more challenges with connecting with financiers and obtaining funding. GIIH is however connecting incubatees with industry and providing recommendation letters to potential stakeholders. This support is helping incubatees find partners, but they still need more networking support to get funding. 2Scale provides their incubatees with potential users, connections to finance, and visibility. 2Scale can do this due to its strong network. It would be difficult for GIIH to replicate such a strong network as they work in many different fields, unlike 2Scale which works mainly with smallholder farmers. But financing is needed in all projects, investments in creating networks for financing and providing visibility for projects could benefit the incubatees of GIIH.

5.3.6 Summary and Answer

During the analysis of the support hubs five aspects were identified, structure of the support, funding, infrastructure, training, and networking. There are many ways university-embedded innovation hubs can use these five aspects to support grassroots innovators, one way is the way GIIH is currently doing it, which is presented above. But to answer the second research question let's look at what university-embedded innovation hubs can learn from GIIH and can learn from 2Scale.

Both organisations follow the three-phased framework. 2Scale identifies the problem with the users first, then brings in the innovator, and then they exit when scaling starts (and replicates elsewhere). GIIH has problems in the third phase (Open market phase, scaling). If this depends on the lack of funding to innovators, lack of business skills of incubatees, or both is difficult to know. One option to resolve the issue could be to make the program longer, get more trainers that can help, and reduce the number of incubatees. Another option, which GIIH is trying, is to deal with this issue by connecting with independent private innovation hubs that can do mentorship for market readiness, and help with market validation, support, and fund incubatees. GIIH is trying to involve more organisations to help incubatees, like private firms and the government (trying to achieve what is called Triple Helix support). University-embedded innovation hubs could try identifying problems/gaps, like 2Scale and then let applicants come up with solutions, or try a mixed approach of GIIH group applications and 2Scale's approach.

The review literature indicates that funding is a big challenge for innovators and the findings from the interviews give a concurrent picture. However, funding is still a challenge after receiving support from GIIH, as one incubatee said, GIIH follows their plans not the needs of incubatees. GIIH is working to improve their funding and is trying to connect incubatees with other funders and supporters. University-embedded innovation hubs should consider establishing networks for funding (e.g., with angel investors, independent hubs, and micro-financers), which 2Scale is doing to some extent. 2Scale helps incubatees get funding by guaranteeing demand and revenue, which helps them get loans. University-embedded innovation hubs should consider doing that as well, but it would require strong networks in the user groups (like 2Scale has) and strong financial muscle.

Infrastructure is identified as a big challenge for innovators both in literature and by managers and incubatees of GIIH. 2Scale on the other hand doesn't seem to mind infrastructure much, this could be because it is less of a problem for their kind of innovators and because 2Scale can pay third parties to make tweaks to products. Right now, GIIH is providing some labs, offices, and funding for infrastructure for incubatees. It has meant some problems with access for incubatees, but GIIH is solving this by building a makerspace. But how effective it will be is a

question as most incubatees are working outside Kigali. However, that allows opening it up for the public hence boosting grassroots innovation and creating an entrepreneurial culture in Kigali. Also, some incubatees will always work outside the area of the hub. But maybe some fields need to work more in rural areas and therefore need central makerspace less. For example, a hub in agriculture might need to be outside the major cities, while a hub working mostly with digital products might work perfectly with a central hub in a big city. Most university-embedded innovation hubs would likely find it useful to have a makerspace to provide infrastructure, but they should consider if the work of incubatees needs to happen away from the hub. Hubs that want to give support to broader grassroots innovation should consider opening their hubs and makerspaces and located in areas where the grassroots people live (e.g., rural areas and poorer neighbourhoods).

Lack of skills and training was identified as a challenge for innovators in literature and by all interviewed groups, particularly technical (e.g., field-specific and research) and business skills. Industry knowledge was also identified as important in the interviews to be able to produce appropriate products. GIIH experience challenges with obtaining enough industry mentors and helping incubatees to scale. GIIH and other university-embedded innovation hubs that experience these kinds of problems can try using external training like 2Scale does or connect incubatees with other hubs to get training and support. According to managers of GIIH, the incubatees graduate before becoming business and investment ready. Some possible explaining factors might be that the incubatees lack knowledge about the diffusion of products, market dynamics, and/or business/managerial skills. University-embedded innovation hubs should consider these factors in their support programs. GIIH help with some things/knowledge that might be too difficult for incubatees (i.e., handling intellectual property). For most university-embedded innovation hubs this is a good idea to do as well, but when supporting broader grassroots innovation, it is probably less necessary, as the innovations are less technical. University-embedded innovation hubs that want to support broader grassroots innovation should also open their education more, that is, having open free lectures that can benefit grassroots innovators and starting shorter professional training programs.

Limited networks are identified as a challenge for innovators in literature and by managers of the two organisations, but incubatees of GIIH don't seem to think that the support they have

received in networking has helped much yet. One potential explanation for that is that networks might not be very important before a business manages to scale. GIIH provides recommendation letters which are appreciated by incubatees, and other university-embedded innovation hubs should do as well. They should also create visibility for their incubatees as 2Scale does. If they want to support broader on a grassroots level they can help set up and create local networks of entrepreneurs in areas where many grassroots people live (e.g., rural areas).

6 Conclusion

In this section, key findings from the discussion are summarised and practical recommendations for university-embedded innovation hubs are given. After that implications for the theory and limitations of the study are discussed. Lastly, potential avenues for future research are given.

6.1 Summary of Key Findings and Recommendations to University-Embedded Innovation Hubs

Identifying & Connecting: How university-embedded innovation hubs should identify and connect with innovators depends on the goals and the roles of the hubs.

- Use easy-to-apply group applications with critical questions. Or use a mixed approach with innovation contests, application calls, lead user method, and networking depending on the situation.

For university-embedded innovation hubs looking to accept groups, the open application style that GIIH is currently employing is probably the best choice. With an easy-to-apply application form that prompts candidates with critical questions. But 2Scale's method is preferable if the innovation hub wishes to take a more active approach, identifying problems to solve.

- Use a staged selection process with trainings, external judges, and clear criteria before the selection process. Or identify a problem and then discuss criteria individually with different identified innovators.

The staged selection process (like GIIH's) is best for university-embedded innovation hubs that play a supportive role. With the rotation of external judges to reduce bias, trainings, and clear criteria to ensure that applicants know what and how to present. If the university-

embedded innovation hub wants to play an innovation-driving role, then individual discussions with individual innovators are better.

- Use criteria suitable for the field and the type of innovator wanted. Good idea to include criteria for passion and commitment.

The two organisations have both similar and different criteria for selection. This is because the two hubs are in different fields and support different kinds of innovators. University-embedded innovation hubs should use criteria that fit their field and that accept the kind of innovators that they want. The similar criteria for the two hubs regard how good the project/innovation is, and how committed/passionate the team is.

- If university-embedded innovation hubs want to connect with grassroots innovators on a broader scale, they should accept projects based on social problems, and innovators from outside the university, help innovators from grassroots communities to apply, and help them where they live.

If a university-embedded innovation hub wants to identify and connect with more innovators from the grassroots level, they should also consider accepting projects based on social problems into their programs, accept all innovators, and focus more on rural (and marginalised) communities.

Support: How university-embedded innovation hubs can support incubatees depends on the role they want to have and on their capabilities. Below are some recommendations for how they should do it.

- Cover the inception (problem validation), protective niche (prototyping), and open market phases (scaling) in the support program. Alternatively, the open market phase can be supported by a collaborating partner hub instead.

University-embedded innovation hubs should follow the three-phased framework of Dana et al. (2021) and support it with training in problem validation, prototyping, and business skills. Hubs can identify gaps to solve (like 2Scale) or let incubatees do it with support (even if they come in with an idea and a prototype). Incubatees should be supported with training and help prototyping. Assigned supervisors are probably an effective way to support this. The open market phase should be supported if the university-embedded innovation hub has the capabilities to do it. If the hub does not have the capability to do that, one option is to let the graduated incubatees rely on bootstrapping, another better option is to connect incubatees with partners (e.g., independent innovation hubs) that can support scaling and funding. Even if scaling is supported internally connecting incubatees with independent innovation hubs and industry would be beneficial for incubatees. University-embedded innovation hubs should consider keeping on giving some help after the incubatees have graduated, at least to get feedback on if their support process is working.

- Fund incubatees in a way that aligns with their needs and establish partnerships and networks that can help with funding. Partnerships and networks are particularly important if the innovation hub has limited capability to fund scaling.

University-embedded innovation hubs should try to fund incubatees in line with their needs. If the university-embedded innovation hubs have limited capacity to fund it should ensure that funding can come from elsewhere, for example, from partner innovation hubs, from networks of angel investors. University-embedded innovation hubs that have the capacity and the mandate should consider guaranteeing loans for incubatees from financial institutions.

- Provide the infrastructure the incubatees need to develop their prototypes (e.g., with a makerspace). But consider carefully what capabilities it should have, where it should be located, and how much incubatees will use it.

Incubatees need infrastructure to develop their prototypes and products, university-embedded innovation hubs should provide this infrastructure. One option to do that is to have a makerspace with the needed capabilities for the field the hub is in. Provide the infrastructure

where it is needed, for example, if incubatees work more in rural areas provide the infrastructure there.

- Provide training in technical skills, soft skills, business/managerial skills, and industry knowledge to incubatees. Also, provide support with complex tasks that require too much training to learn.

University-embedded innovation hubs should provide all the skills and knowledge required to create the product and scale the business. Technical skills like research, market validation, and field-specific ones. Soft skills like presenting, pitching, and professionalism. Business and managerial skills like market dynamics, diffusion of products, organising, and how to manage a team. Industry knowledge helps innovators find a gap (i.e., an unsolved problem) and produce a relevant product. It can be difficult for university-embedded innovation hubs to provide all necessary skills and knowledge, if they have problems they should consider collaborating with other hubs or paying for external training to cover it all. University-embedded innovation hubs should also provide support with tasks that are too complex for incubatees. For example, consider managing intellectual property applications for incubatees as intellectual property rights and how to apply for protection can take up too much time for incubatees.

- Provide useful networks for incubatees. Networks should be created to connect incubatees with stakeholders, partners, industry, and financiers. Also, consider providing recommendation letters and visibility to build trust for the incubatees.

University-embedded innovation hubs should provide a network that connects incubatees with stakeholders, partners, industry, and financiers (e.g., angel investors, micro-finance). University-embedded innovation hubs can also use their networks, trust, and reputation to help incubatees. This can be done by providing visibility on websites, social media, and events, and by providing recommendation letters to potential stakeholders.

- If university-embedded innovation hubs want to support grassroots innovation on a broader scale they should consider opening their infrastructure (e.g., makerspace) and education to the public, locate infrastructure where the grassroots live and create local networks for the grassroots to connect. However, support with managing intellectual property applications is probably less important.

If university-embedded innovation hubs want to provide support on a wider grassroots level, there are a few things they can do. They can open their infrastructure and education more for the grassroots. Regarding infrastructure, they can let the grassroots use it when capacity is available and locate it closer to the grassroots. The education can also be opened to the grassroots, for example, by giving free lectures, starting short professional training programs, or providing scholarships to people from the grassroots. Another thing the university-embedded innovation hubs can do is create local networks in grassroots communities which entrepreneurs can use to connect and work together. However, support for intellectual property is probably less important as grassroots innovations tend to be less technical.

The findings from the interviews and literature review suggest that university-embedded innovation hubs can use these recommendations to connect with and support grassroots innovators better. Hence, contributing stronger sustainable development to an innovation system that improves lives by potentially lifting people out of poverty by creating work and solving unsolved problems at the grassroots level.

6.2 Implications for Theory

This article contributes a few things to the literature. The work is novel as there are no previous articles (known to the author) on how innovation hubs can support grassroots innovators, and how the support is experienced by managers and incubatees. Academics can further build on this work to understand how institutions can support grassroots innovators. Also, there are no previous articles (known to the author) on how university-embedded innovation hubs conduct their application and selection process. Furthermore, the work contributes to understanding how to create an impactful and transformative hub in developing

countries, as supporting grassroots innovation can lead to stronger sustainable development. The study also provides further evidence for and aligns with the findings of the reviewed literature on challenges of grassroots innovation as similar challenges to development are reported by the interviewees, for example, limited capital, lack of skills, and lack of infrastructure. The work also compares a university-embedded innovation hub and an independent innovation hub, contributing to understanding their differences in roles, goals, and support practices.

There are a few limitations to the study. Although no case study is generalisable, this study could have benefitted from more interviews. More interviews in general and interviews with incubatees from 2Scale specifically might have benefitted the study but were unobtainable due to lack of time. More interviews, in general, would give more data and potentially provide more valuable knowledge about the support practices, how effective they are, and how they are experienced by incubatees. Interviews with incubatees from 2Scale would allow for a comparison of the experiences and views of managers and incubatees regarding the application/selection and support functions of 2Scale. That would give a triangulation to ensure 2Scale's support is received and experienced in the way they intend it to be.

Comparing GIIH and 2Scale is difficult as they have more different roles than expected. GIIH focuses on helping students develop their innovations. While 2Scale focuses on helping smallholder farmers and base-of-the-pyramid consumers by identifying a problem and bringing in different innovators (including multinational firms) and supporting the development/tweaking of their innovations. For example, university-embedded innovation hubs do not need to help multinational firms, while 2Scale does it because it helps smallholder farmers and base-of-the-pyramid consumers. The two organisations' roles (and whose innovation process they are supporting) are fundamentally different. This makes their practices less comparable, there is however still room for comparison and learning between the two.

6.3 Future Research

This study opens many interesting avenues for future research, a few are presented below.

It would be interesting to analyse the causal linkages of the different recommended practices on the success of incubatees' businesses and incubators. For example, does funding in instalments or having a makerspace lead to more successful businesses and more innovation? Also, if it contributes to grassroots innovation.

Two other interesting topics for research related to innovation hubs in developing countries. Firstly, funding flows both to the hub and to the incubatees as funding tends to be smaller in developing countries. For example, analyse different ways hubs can generate cash flow, like translating research. Secondly, as funding tends to be weaker an option for hubs is to collaborate in their support of incubatees. Analysing partnerships could help identify what kinds of partnerships are most effective and under which circumstances.

Another topic is to analyse the open market phase (i.e., scaling phase) deeper. Investigating practices of other university-embedded and independent innovation hubs in this aspect could potentially bring valuable insights into challenges, strategies, and key success factors. An option is to do case studies with innovation hubs that are particularly successful in helping incubatees to scale their businesses.

Lastly, it would be interesting to analyse the strong networks of 2Scale. The networks of smallholder farmers and base-of-the-pyramid consumers are one of 2Scale's main strengths. The networks give 2Scale one of their main capabilities, "brokering linkages". 2Scale's network seems to be one of its key success factors. Investigating the practices regarding network utilisation of 2Scale or other hubs with similar strengths could give a deeper understanding of how useful they can be when they can be useful, and which kinds of

innovation hubs would benefit from building networks. A study could analyse how networks are utilised, how they are built, and how they are maintained.

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Appendices

Appendices 1 and 2 regard the thematic analysis and present coding, first-order concepts, second-order concepts, and aggregated constructs. Appendix 3 presents the interview guides.

Appendix 1: Thematic Analysis Framework 1

This appendix relates to the first research question and presents the first-order concepts separated by organisation (GIIH and 2Scale), the second-order concepts, and the aggregated constructs. The framework shows how different concepts relate to each other, for example, application process, criteria, and selection process are important contributors to how innovation hubs identify and connect with innovators.

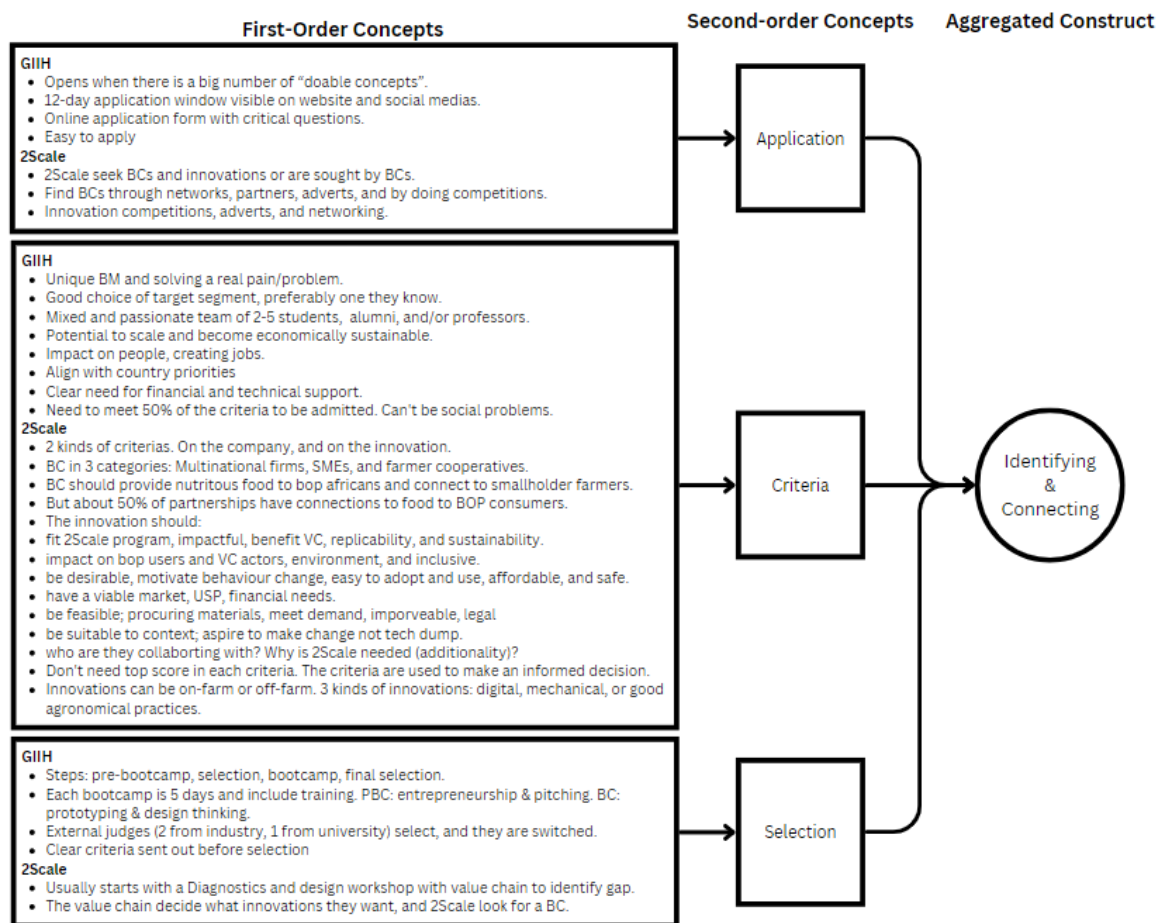


Figure 1: This figure presents the first-order concepts, second-order concepts, and aggregated constructs related to the thematic analysis of the first research question. Source: developed by the author.

Appendix 2: Thematic Analysis Framework 2

This appendix relates to the first research question and presents the first-order concepts separated by organisation (GIIH and 2Scale), the second-order concepts, and the aggregated constructs. The framework shows how different concepts relate to each other, for example, the structure of the support programs and different aspects like funding and networks contribute to the efficiency of the support programs.

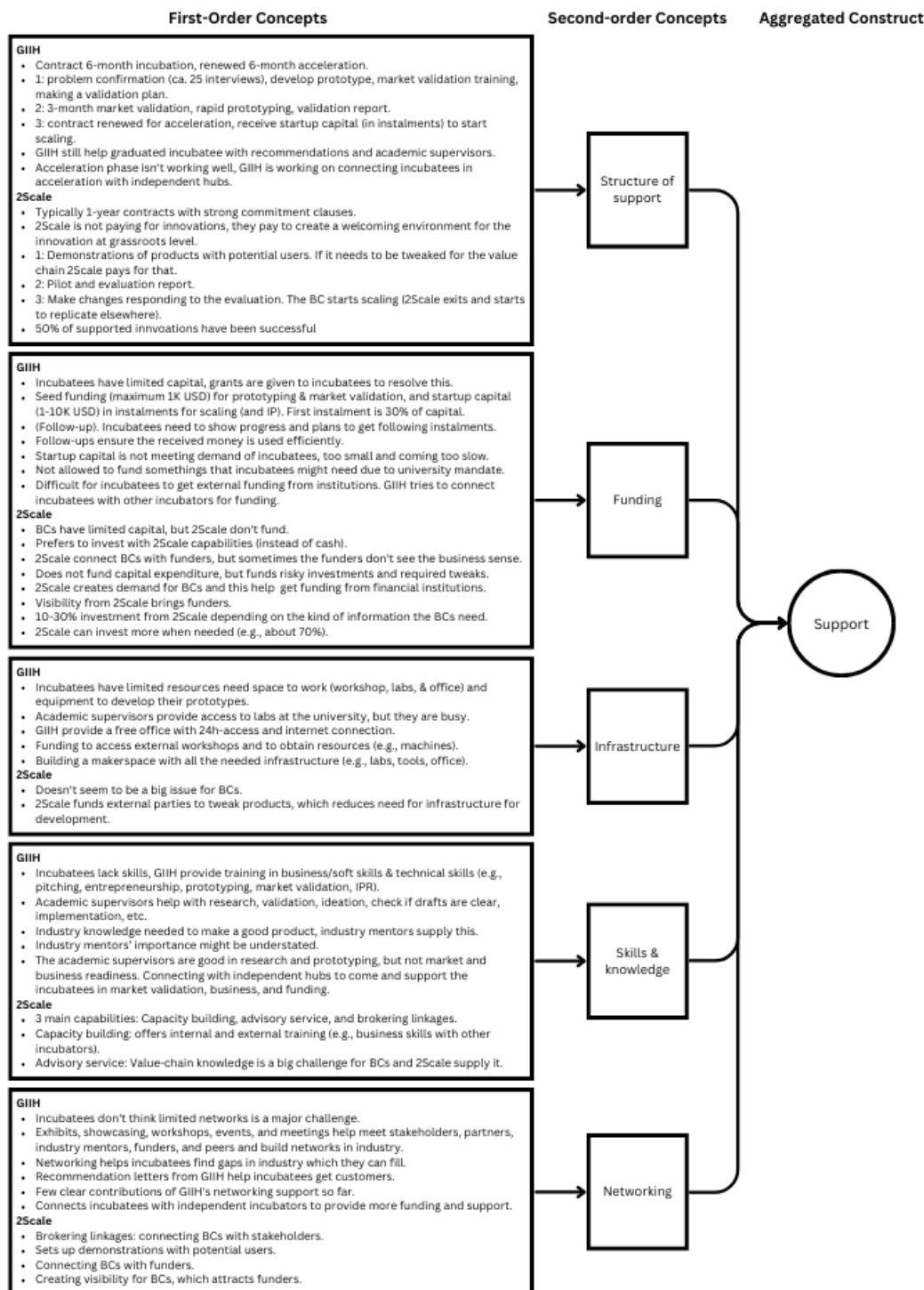


Figure 2: This figure presents the first-order concepts, second-order concepts, and aggregated constructs related to the thematic analysis of the second research question. Source: developed by the author.

Appendix 3: Interview Guides

The interview guides can be found below. The questions are in bold, and prompt questions are in parenthesis. Before the interviews the interviewees were given interview guides without the prompt questions to prepare.

First, some small talk usually occurred. Then, before the interviews started what innovators (which are entrepreneurs, people creating solutions, or incubatees if they are part of an incubation program) were explained, and that the support to them through incubation programs was the main interest of the study. It was also explained that grassroots innovators (innovators from poorer or marginalised communities whose needs aren't being met by regular innovation systems, states, or markets) were especially relevant to the study. Then, interviewees were asked if it was okay to record the interview. Lastly, the interview started.

Interview Guide for Managers

Introductory questions

1. Could you please briefly introduce yourself?
2. What is your role at the hub? What are your tasks? (Prompt: How long have you had this role?) (Prompt: How long have you worked with this type of work?)

Main questions

RQ1: Identification & Connection

3. What conditions/criteria must innovators and their innovation projects fulfil to join your incubation or support programs? (Prompt: How do you decide which projects to support?)
4. How do you identify innovators and innovation projects to support? (Prompt: Do you work with individuals, groups, or both?)

Problems & Challenges

5. What problems do innovators face?

RQ2: Support

6. Do you have a framework or set structure for the support you give? (Prompt: How do you communicate with innovators?)
7. How do you help solve the problems innovators face?
(Prompt: What training do you offer?)
(Prompt: How do you help innovators develop their ideas/innovations?)
(Prompt: Do you give access to physical or digital infrastructure? What?)
(Prompt: How do you help with funding and resources?)
(Prompt: How do you work to support the market success of products and services? (marketing & diffusion))
(Prompt: How do you work with building networks and trust?)
8. What problems can't you help innovators solve? (What problems are difficult for 2Scale to help with?) (What challenges tend to break projects?)
9. How do you act to build a system or society that is more welcoming to grassroots innovation? (Prompt: Do you work with cultures and attitudes in some way?) (Prompt: Do you work with public infrastructure?)

Finishing questions

10. If I really want to understand the support, you give and your role what should have asked you that I haven't? (Prompt: Could you tell me more about that?)
11. From your experience in this area, what advice would you offer to others trying to support innovators?
12. Do you have anything you want to add or any questions for me?

Interview Guide for Incubatees

Introductory questions

1. Could you please briefly introduce yourself? (Prompt: How long have you worked with starting companies?)
2. Could you explain your innovation project a little bit? (Prompt: Which period were you incubated?) (Prompt: I understand you must have a team to join GRID. Could you briefly describe your team?)
3. What are you doing at the hub, and why are you incubated there?

Main questions

RQ1: Identification & Connection

4. What conditions did you and your project have to fulfil to be able to join the incubation program?
5. How did you experience the application and selection process?

Problems & Challenges

6. What problems have you faced before and are you facing now in your project?
(Prompt: What is the biggest problem with the project right now?)

RQ2: Support

7. What support is the incubator giving you?
(Prompt: What funding and resources do they provide you?)
(Prompt: What training and skills are you offered?)
(Prompt: How do they help you develop your innovation?)
(Prompt: Do you get access to any physical or digital infrastructure)
(Prompt: How do they support the market success of your innovation?)
(Prompt: Do they provide you with access to networks?)
8. How are you making use of the support the incubator gives?
(Are you using the things they provide? Could you give an example?)
(What has been valuable for your project?)
(Prompt: How do you communicate with your mentors and team at the incubator?)
9. What problems haven't they tried to help you solve or tried but failed to help you with?
10. Could you give some feedback on the support programme? Which parts of the support are working well and less well?
11. How does the support you receive help you change your community? (Prompt: Has it affected attitudes and culture?) (Prompt: Is the hub changing your community in some way? How?)

Finishing questions

12. If I really want to understand the support that you have benefitted from what should have asked you that I haven't?
(Prompt: Could you tell me more about that?)

- 13.** From your experience in this area, what advice would you offer to people trying to support innovators like yourself?
- 14.** Do you have anything you want to add or any questions for me?

LUISS executive summary

Introduction

This study aims to compare the grassroots innovation-supporting practices of a university-embedded innovation hub and the practices of another hub which has strong capabilities in this area. The practices of the two hubs will be analysed. Then, recommendations of practices will be made for university-embedded innovation hubs.

There are multiple concepts of innovation, and some relate to the innovation created by poorer entrepreneurs or innovations targeted at poorer communities. As more developed markets starts to become more saturated with firms and competition, an incentive to target developing markets is growing for multinational companies. The developing countries have large populations, although the average consumer is poorer and the market capitalisation in a sense becomes smaller because of that. Even still the market capitalisation is significantly large to be attractive for international companies. International companies have tried to make innovations for the poor, or for the base-of-the-pyramid consumers. The base-of-the-pyramid can be defined as “*poor or low-income population with limited capacities to become producers or consumers in the globalized marketplace*” (Bagchi-Sen et al., 2015, p. 269). But innovating for the poor or for a market that might be missing important features (e.g., distribution networks) can be challenging. To resolve these issues companies can work with new partners like NGOs or directly with the poor, try new business model, and try new pricing models. There are a few approaches to innovating for base-of-the-pyramid consumers. One tried by multinational companies is pro-poor innovation. This kind of innovation typically revolves around making products as cheap as possible by cutting features of the companies’ existing products or making smaller packages (Karnani, 2006). But this approach doesn’t involve the poor in development or production, and the success of this approach is questionable (Bagchi-Sen et al., 2015), as the base-of-the-pyramid don’t want to buy a lot of junk products but rather want a few carefully selected good-quality products (Bagchi-Sen et al., 2015). Another approach to innovate for the poor is inclusive or frugal innovation. This approach has a more complex goal compared to pro-poor innovation, which is to actually meet the demand of the base-of-the-pyramid, to do that, high-quality and high-performance products are created and sold at affordable prices (Bagchi-Sen et al., 2015). Users of this approach to innovation also work with new business models and partnerships (with NGOs and poor) to create innovations. Another approach to

innovate for the poor or maybe rather a concept of innovation is grassroots innovation, which is the interest of this study. In this kind of innovation, it is the poor or people from the base-of-the-pyramid that create the innovations. These innovations often solve local self-experienced problems and use locally available resources, this makes the innovations appropriate for the context they are in. However, grassroots innovation projects are typically small-scale and large-scale adaption (or diffusion) can be difficult (OECD, 2015; Seyfang & Smith, 2007). Grassroots entrepreneurs and multinational companies can collaborate. Such collaborations can give the companies more locally appropriate products and give the entrepreneur access to a larger market (Bagchi-Sen et al., 2015). However, for local entrepreneurs and multinational companies to come in contact is difficult, but it is something innovation hubs can help with. Boosting and supporting grassroots innovation can be an approach to create effective innovation for the base-of-the-pyramid (poorer) consumers, while also potentially alleviating poverty and providing the poor solutions to their unsolved problems.

There isn't any widely used definition of grassroots innovation, but it can be simplified as innovation by the poor for the poor. It is often carried out by entrepreneurs or groups from marginalised (or base-of-the-pyramid) communities that try to solve local self-experienced problems outside the regular innovation system with limited resources (more explanations and definitions of grassroots innovation are given in section 2.1). The entrepreneurs and groups are called grassroots innovators/actors/groups/communities and feel the need to do this as their problems are not being solved by the regular innovation system. The working definition of marginalised communities for this thesis is poor communities where people don't get what they need from the market.

Innovation is difficult, and these grassroots innovators face additional challenges in their innovation efforts due to their circumstances. Different challenges to grassroots innovation projects have been identified including intrinsic challenges like finding resources, funding, keeping volunteers, and insufficient managerial skills (Seyfang & Smith, 2007; Hossain, 2018; Jones et al., 2019; Bernstein et al., 2021), diffusion challenges (i.e., taking innovations from a protective niche to the open market; Seyfang & Smith, 2007; Dana et al., 2021), extrinsic challenges (i.e., geographical rootedness, context specificity, ideological commitment;

Hossain, 2018), social-cultural-commercial trilemma (Jones et al., 2019), fitting into the local situation/system (Smith et al., 2014), lack of community involvement (Dana et al., 2021).

Independent and university-embedded innovation hubs can help grassroots innovators in their efforts, but how the hubs can do this is understudied. Some hubs focus on supporting grassroots actors (e.g., 2Scale and UNDP Accelerator Labs), but most of these are publicly funded independent hubs.

This study aims to analyse how innovation hubs support grassroots actors through their support programs (more details on support programs in section 2.2) and what the newer different university-embedded innovation hubs can learn from them. As the two kinds of hubs are different university-embedded innovation hubs will have to choose those practices that fit their structure and context. The benefits of increased support of grassroots projects include the involvement of the people who experience the problems, which have the best insight. It can help lift people out of poverty by creating new supply chains and jobs. Grassroots projects are perceived to have a higher chance of success (Cherunya & Ahlborg, 2020), as the community is more involved in the production and diffusion of innovations. These three benefits probably fit quite nicely with many university-embedded innovation hubs' aims to support local innovation systems and contribute to society and will likely motivate them to consider what they can learn from grassroots supporting practices.

Research questions

- I. How are innovation hubs identifying and connecting with grassroots innovators?
- II. How can university-embedded innovation hubs support grassroots innovators in their efforts?

Literature review

Grassroots innovation

Grassroots innovation can be called innovation for the poor by the poor, and it aims to solve local problems. It can be the application and marketing of elsewhere existing innovations targeting local under-served consumers and often the innovations are incremental (OECD,

2015). The UNDP Accelerator Labs and the London School of Economics and Political Science define grassroots innovations as "*indigenous solutions, created by actors in civil society and supported by limited resources, which aim to address local situations and often achieve sustainable development.*" (Rungachavalnont, 2021). Grassroots innovation essentially means that people solve their self-experienced problems, and this can be done alone or with help from institutions. The OECD (2015) highlight that they often occur in the informal economy and although the poor are involved in grassroots innovation, they can be involved to varying degrees. They can have smaller roles (e.g., retailer of a new product) supported by actors in the innovation system, like universities, NGOs, or private firms, or they can have bigger roles (e.g., innovator or joint producer). Grassroots innovations emphasise the empowerment of low-income communities and being inclusive to marginalised and low-income communities (Heeks et al., 2013). Dana et al. (2021) define grassroots innovations as innovations developed to address local-specific opportunities and challenges that can have the potential "*to be turned into entrepreneurial ventures, and generate a livelihood for the innovator as well as others in the community*" (Guttikonda, 2016, p. 6, as cited by Dana et al., 2021). The main differences between grassroots innovation and classical innovation are that grassroots innovation: involve the poor or marginalised, solves local self-experienced problems (e.g., lack of livelihood or education), is done outside the regular innovation system, and is often done with very limited resources.

To summarise, there is a need to solve local problems in developing economies, grassroots innovation has the potential to create the needed local solutions, and grassroots innovations different from regular innovation in a few keyways. There is no widely used definition of grassroots innovation, but the literature discusses a few factors that distinguish grassroots innovation from regular innovation. These are the involvement of poor or marginalised people (to varying degrees), sparse funding, innovation created outside the regular innovation system (often in the informal economy) and solving local often self-experienced problems.

Innovation hubs, accelerators, and incubators

Innovation hubs, incubators, and accelerators play important roles in innovation systems. They all support ventures in their different stages. Cherunya and Ahlborg define innovation hubs as being the following:

social communities and workspaces that together function as safe spaces for impactful ideas to be identified and nurtured in the early stages to withstand open market pressures. The nurturing and protection are provided to innovators and entrepreneurs through access to subject-matter expertise on technical and market trends and access to practical tools and resources. More significantly, hubs provide the venture owners with a safe space to fail. (2020, p. 7)

Innovation hubs, incubators, and accelerators are enablers of innovation and entrepreneurship through their support programs. In their programs, they can support innovators in their development processes by providing incubatees with what they need to develop their innovations. For example, the skills, funding, infrastructure, and networks, among other things required. The skills can be training in business skills or prototyping. Infrastructure can be workshops and tools. Funding can be to develop the product or to start the business. Networks can be connections with stakeholders or partners. But these institutions can also become enablers of grassroots innovation with some considerations. For example, if they are willing to accept innovators from the grassroots level of society into their programs and make considerations for their challenges (like limited capital and education) in the support programs. This is especially needed in developing countries where more people live in poverty. Some hubs focus on inclusive and grassroots innovation and work with supporting grassroots innovators. Two examples of such innovation hubs are UNDP Accelerator Labs and 2Scale.

Challenges to grassroots innovation

Multiple specific challenges are put forth in the literature and most of these fit into the two categories of challenges of Seyfang and Smith (2007). The intrinsic challenges relate to among other things resources, retaining volunteers, training, organisational difficulties, and networks, and challenges identified by multiple other authors can be classified in this category (Bernstein et al., 2021; Seyfang & Haxeltine, 2011; Jones et al., 2019; Smith et al., 2014; Hossain, 2018). For example, Hossain (2018) identified the extrinsic challenges of geographical rootedness, context specificity, and ideological commitment, these challenges do relate to the intrinsic challenges in that they are reduced with appropriate training and volunteer retention methods. And the social-cultural-commercial trilemma of Jones et al. (2019) also relate to intrinsic challenges as they can be reduced with training managers and network-building. Diffusion is

also a common theme in the reviewed literature (Smith et al., 2014; Hossain, 2018; Dana et al., 2021), most view it as taking innovations from a protective niche to the open market. Some of the authors give recommendations for solving presented problems. Smith and Stirling (2018) suggest five factors to support grassroots innovation, culture, infrastructure, training, investment, and openness, some of which hubs could consider, particularly culture, infrastructure, and training. Bernstein et al. (2021) recommend hubs act as guarantors for loans and manage grants, offering appropriate training, and empowering communities. Dana et al. (2021) developed a framework of three phases to support grassroots projects, the framework focuses on idea development, prototyping, and diffusion, and the authors also conclude that including the community in all phases is crucial. This inclusion could be achieved by training innovators in design thinking and agile development. Hubs could use the framework to support grassroots innovators.

Methods

Multiple actors in the innovation system will be of interest to the study, but two will be especially important. These are the University of Rwanda's Grid Innovation and Incubation Hub (GIIH) and 2Scale. 2Scale is the largest incubator for inclusive agribusiness in Africa and is active in 10 African countries. 2Scale works with grassroots innovation and has been active for multiple years. They were the main subjects of analysis in this research design. The design was a comparative case study analysing the practices of the hubs regarding support of grassroots innovators to see what they are doing, what they can learn from each other, and especially what practices the developing university-embedded GIIH can use in its context. More specifically it is the incubation and acceleration programs of the two innovation hubs that are of main interest because they are major activities in the support such innovation hubs give to innovators. To understand these programs managers of the two organisations and incubatees of GIIH will be interviewed. Interviewing incubatees as well as managers helps collect richer data about the support programs the incubatees are benefitting from. Views of managers and incubatees from GIIH are compared to gauge if managers and incubatees have the same views of the support, the challenges the incubatees are facing, and any unsolved challenges. If there are misalignments it could mean that managers are misunderstanding a challenge faced by incubatees, have a strong belief in a support that isn't helping much, or that managers are unaware of a challenge incubatees are facing. Comparing the views can help understand if the

support is well-suited to alleviate the challenges of the incubatees. Incubatees are only interviewed from GIIH. This is because the innovation hub GIIH is the main subject of the study and to understand which support practices GIIH can use the context of the GIIH must be better understood. Interviewing managers from 2Scale generates ideas (support practices) that GIIH can try out, interviewing incubatees from 2Scale would show if the ideas work in 2Scale's context and for an independent hub with 2Scale's goals and structure. That might be interesting for another study, but it is not the purpose of this study.

Collection of data

Nine interviews were conducted six with managers and three with incubatees from GIIH. The managers at GIIH were the Head of Grid Innovation and Incubation Hub who runs the innovation hub and has deep knowledge in strategic and organisational matters as well as some experience in supporting incubatees. The product development manager at GIIH works with supporting incubatees daily and has rich knowledge about the incubation programs of the innovation hub. The manager from 2Scale was the thematic coordinator on green innovations and country team leader of IFDC in Nigeria and Egypt who manages a portfolio of partnerships with incubatees, have organisational responsibilities, and works hands-on with incubatee projects. Interviews with incubatees provided knowledge of their experiences of challenges and support.

Methods of analysis

The coding in this project is completed stepwise and consists of three levels. The three levels are first-order concepts, second-order concepts, and aggregated constructs, and they will be developed sequentially. This is inspired by the three-level coding presented by Bell et al. (2022) and by the method of concept development by Gioia et al. (2013). The first level mostly summarises what the interviewees said and will emerge from the text, this method helps theory to emerge from the material and is inspired by grounded theory (Suddaby, 2006). The second level is meant to create a deeper awareness of the text by recoding, comparing, consolidating, and regrouping (Bell et al., 2022). The third and last level of code will entail finding connections between codes and properties of codes to gain a deeper understanding. The concepts will then be visualised with a Gioia-inspired framework (Gioia et al., 2013) to analyse

connections further and present findings. The concepts and constructs will then be discussed with the research questions in mind.

Findings

This table summarises the key findings of the interviews. The darker cells refer to respondents from GIIH, while the white cells refer to managers from 2Scale. The findings of GIIH managers and incubatees are contrasted on the utmost right side of the table.

Topic	Managers	Incubatees	Contrast GIIH Manager/Incubatee
Application	12-day application window. Opens when there is a big number of “ <i>doable concepts</i> ”.	Easy application process.	No significant difference.
	Both seeking innovators and being sought out. Usually starts by identifying a gap in a value chain in a value chain analysis. 2Scale have used their networks, adverts, and contests to find innovators and innovations.		
Selection	External judges. Steps: 1. 5-day pre-bootcamp training in entrepreneurship and pitching. 2. 5-day bootcamp training in design thinking and prototype development. 3. Sign contract.	Trainings before selection helps incubatees show the best of their ideas. Clear criteria. External judges.	No significant difference, but the trainings before selection are appreciated by incubatees.
	Steps: 1. Value chain analysis with stakeholders. 2. Find innovator. 3. Meeting to discuss criteria. 4. Decision can take up to 5 days. 5. Sign contract.		
Criteria	Student or alumni of the university. Team, 2-5 members. Align with country priorities (e.g., Vision 2030). Sustainability and scalability (scale in 12 months). Criteria are stricter.	Student, alumni, or professor from the university. Must have a team. Have a registered firm (maybe not). Align with national strategy.	Professors can apply. Maybe must have a registered firm before application.
	Accepts SMEs, farmer cooperatives, or multinational firms. 2 kinds of criteria: innovator-criteria & innovation-criteria. Fit with the program: 1. African food security, 2. Connect with smallholder farmers, 3. Nutritious food. 50% of incubatees fulfil these 3 criteria. Sustainability & scalability. Criteria guide the decision.		
Structure	More focus on teaching and developing entrepreneurs. Academic supervisors. Important steps: Incubation phase (developing the prototype, training in market validation, making a validation plan and budget, 3-month validation, report) and Acceleration phase (selection, grant, scaling business).	GIIH help graduated incubatee with recommendations.	GIIH help graduated incubatee with recommendations.
	More focus on projects and deals. Important steps: Incubation phase (demonstrations with farmers, tweak the product, pilot, evaluation) and Acceleration phase (tweak again, scaling without 2Scale, 2Scale replicates elsewhere).		

Funding	Grants. Funding for prototype & market validation, and startup capital in instalments for scaling. Startup capital varying amounts depending on potential, and in instalments (first 30%). Funds IP.	Need more funding for scaling and inputs. Difficult to get funding from institutions (but pitching skills help). Capital is too small and coming too slow. Difficulty funding somethings (e.g., land purchase). Follow-ups ensure the money is used wisely.	Startup capital is insufficient, but management is working to fix this. Pitching trainings help do fundraising. University mandates can make things difficult for incubatees. Follow-ups ensure the money is used wisely.
	“No subsidies” (counter-performance expected). Not funding capital expenditures. Prefers to invest with 2Scale capabilities (instead of cash). Broker linkages with financial institutions. Funds incubatees risky investments (e.g., demonstrations). Funds if products need to be changed.		
Infrastructure	Free office (24h access) with internet. Some access to labs with tools. Funding for external space/workshops. Building a makerspace with labs and tools.	Free office (24h access) with internet. Some access to labs. Funding for external space/workshops. Need labs.	No significant difference, but the makerspace is needed.
	Not a big issue. Funds external parties to tweak products, reduces need for infrastructure.		
Skills/knowledge	GIIH give training in business/soft skills & technical skills (e.g., pitching, entrepreneurship, prototyping, market validation). Academic supervisors help. Industry knowledge needed to make a good product, industry mentors supply this. Industry mentors’ importance might be understated.	Limited business/soft & technical skills, GIIH give trainings. Academic supervisors help. GIIH challenge thinking & prototypes. Access to information (e.g., database).	No significant difference.
	Industry/value-chain knowledge is a big challenge and 2Scale provides it. 2Scale can give internal & external training to incubatees.		
Networking	Events, workshops, exhibiting, showcasing. Roundtable Business Networking events connect incubatees with industry and funders.	Not a major challenge. Exhibits, showcasing, and meetings help meet stakeholders and peers. No clear contribution yet. Recommendations help get customers.	Maybe different views on contribution of networking. Recommendations are appreciated.
	1 of 2Scale’s strengths: “Brokering linkages”. Sets up demonstrations with potential users. Connects incubatees with funders. Creates visibility for incubatees, which attracts funders.		

Discussion

RQ1: How a university-embedded innovation hub like Grid Innovation and Incubation hub can identify and connect with grassroots innovators is a difficult question. One way is to do it in the way that GIIH is currently doing it as previously presented and discussed, but is that the optimal way? It depends on the goals and the role of the hub. When it comes to application (or getting in touch with innovators) the open application format which GIIH is currently using is probably the best of the discussed options for GIIH and other university-embedded hubs due to the role and different goals identified in the interviews. They also have some nice features in their application process already with the easy application form that prime the applicants with critical questions. In the selection process, the role of the hub is important. If a hub has more of a supporting role (like GIIH) than an innovation-driving role, then a selection process

like GIIH's is more appropriate. The selection process of GIIH also have some nice features, external judges that are switched between selection rounds to reduce bias in selection. Training provided before selection guide applicants in what they should present and how, to show the most important sides of their projects. 2Scale however, identify the problem to be solved and find an innovator to do it. Identifying the gap before developing the product ensures there is demand, which leads to higher chance of success. GIIH also provide clear criteria for selection which are sent out before selection, this also guide applicants in what they should present. 2Scale has more and some different criteria for selection compared to GIIH. This is because the two hubs are in different fields and support different kinds of innovators. The criteria that GIIH use could be appropriate for similar university-embedded innovation hubs in their selections processes with some minor adjustments for the field they are in. These answers assume that a potential university-embedded hub a similar role and goals as GIIH does. If a university-embedded innovation hub wants to support broader grassroots innovation, they should also consider accepting projects based on social problems into their programs. This would give a large impact as such projects have difficulties gaining funding as they typically don't follow a commercial logic and have low returns on investment.

The organisations are more different than expected. 2Scale work more like a private equity firm driving individual innovation projects, which is different from GIIH's current program. GIIH's program is more like a startup course taking in many applicants at a time. Other university-embedded hubs could use a similar approach as GIIH or try 2Scale's private equity-like approach. 2Scale's approach is more difficult and expensive, but it seems to be a more effective strategy, however it might not align with university mandates. University mandates has been identified as a challenge to the management of the hub for GIIH. However, maybe going for an approach like 2Scale's could work well for university-embedded innovation hubs that want to have a more active role in which problems are solved. It does however mean supporting fewer projects at a time, which potentially reduces the impact of the hub. If challenges with funding and scaling can be solved by collaborating with other supporting institutions, then an approach like GIIH's might be more impactful. But if they cannot be solved, then an approach like 2Scale's or reducing the number of incubatees might be more effective. However, the 2Scale approach requires stronger networks in different fields and having the mandate from the university to do it. If university-embedded innovation hubs want to give broader support to grassroots innovation, they could skip the criteria for being students

or alumni and having a formal education, and they could also consider bringing their support to rural areas.

RQ2: During the analysis of the support hubs five aspects were identified, structure of the support, funding, infrastructure, training, and networking. There are many ways university-embedded innovation hubs can use these five aspects to support grassroots innovators, one way is the way GIIH is currently doing it, which is presented above. But to answer the second research question let's look at what university-embedded innovation hubs can learn from GIIH and can learn from 2Scale.

Both organisations follow the three-phased framework of Dana et al. (2021). 2Scale identify the problem with the users first, then bring in the innovator, and then they exit when scaling start (and replicates elsewhere). GIIH has problems in the third phase (Open market phase, scaling). If this depends on the lack of funding to innovators, lack of business skills of incubatees, or both is difficult to know. One option to resolve the issue could be to make the program longer, get more trainers that can help, and reduce the number of incubatees. Another option, which GIIH is trying, is to deal with this issue by connecting with independent private hubs that can do mentorship for market readiness, and help with market validation, support, and fund incubatees. GIIH is trying to involve more organisations to help incubatees, like private firms and the government (trying to achieve what is called Triple Helix support). University-embedded innovation hubs could try identifying problems/gaps, like 2Scale and then let applicants come up with solutions or try a mixed approach of GIIH group applications and 2Scale's.

The review literature indicates that funding is a big challenge for innovators and the findings from the interviews give a concurrent picture. However, funding is still a challenge after receiving support from GIIH, as one incubatee said, GIIH follows their plans not the needs of incubatees. GIIH is working to improve their funding and is trying to connect incubatees with other funders and supporters. University-embedded innovation hubs should consider establishing networks for funding (e.g., with angel investors, independent hubs, and micro-financers), which 2Scale is doing to some extent. 2Scale helps incubatees get funding by guaranteeing demand and revenue, which helps them get loans. University-embedded

innovation hubs should consider doing that as well, but it would require strong networks in the user groups (like 2Scale has) and strong financial muscle.

Infrastructure is identified as a big challenge for innovators both in literature and by managers and incubatees of GIIH. 2Scale on the other hand doesn't seem to mind infrastructure much, this could be because it is less of a problem for their kind of innovators and because 2Scale can pay third parties to make tweaks to products. Right now, GIIH is providing some labs, offices, and funding for infrastructure for incubatees. It has meant some problems with access for incubatees, but GIIH is solving this by building a makerspace (i.e., a workshop/office with all tools and equipment needed for the development of innovations). But how effective it will be is a question as most incubatees are working outside Kigali. However, that gives an opportunity to open it up to the public hence boosting grassroots innovation and creating an entrepreneurial culture in Kigali. Also, some incubatees will always work outside the area of the hub. But maybe some fields need to work more in rural areas and therefore need central makerspace less. For example, a hub in agriculture might need to be outside the major cities, while a hub working mostly with digital products might work perfectly with a central hub in a big city. Most university-embedded innovation hubs would likely find it useful to have a makerspace to provide infrastructure, but they should consider if the work of incubatees needs to happen away from the hub. Hubs that want to give support to broader grassroots innovation should consider opening their hubs and makerspaces and locate in areas where the grassroots people live (e.g., rural areas and poorer neighbourhoods).

Lack of skills and training was identified as a challenge for innovators in literature and by all interviewed groups, particularly technical (e.g., field specific and research) and business skills. Industry knowledge was also identified as important in the interviews to be able to produce appropriate products. GIIH experience challenges with obtaining enough industry mentors and helping incubatees to scale. GIIH and other university-embedded innovation hubs that experience these kinds of problems, can try using external training like 2Scale does or connect incubatees with other hubs to get training and support. According to managers the incubatees of GIIH are graduated before being business and investment ready. Some possible explaining factors might be that the incubatees lack knowledge about diffusion of products, market dynamics, and/or business/managerial skills. University-embedded innovation hubs should

consider these factors in their support programs. GIIH help with some things/knowledge that might be too difficult for incubatees (i.e., handling IP). For most university-embedded innovation hubs this is a good idea to do as well, but when supporting broader grassroots innovation, it is probably less necessary, as the innovations are less technical. University-embedded innovation hubs that want to support broader grassroots innovation should also open their education more, that is, having open free lectures that can benefit grassroots innovators and starting shorter professional training programs.

Limited networks are identified as a challenge for innovators in literature and by managers of the two organisations, but incubatees of GIIH don't seem to think that the support they have received in networking has helped much yet. One potential explanation for that is that networks might not be very important before a business manages to scale. GIIH provides recommendation letters which are appreciated by incubatees, and other university-embedded innovation hubs should do as well. They should also create visibility for their incubatees, like 2Scale does. If they want to support broader on a grassroots level they can help set up and create local networks of entrepreneurs in areas where many grassroots people live (e.g., rural areas).

Conclusion

This summary includes the recommendations of this work that managers of innovation hubs can learn from regarding support of incubatees and broader grassroots innovation. Which recommendations are appropriate depends partly on the role of the innovation hub. Innovation hubs can be drivers of innovation that identify problems/gaps and search for solutions, or they can be supporters of innovators (i.e., not identifying problems/gaps on their own). Innovation hubs should consider what kind of role they want to have before applying these recommendations. Find the short-form recommendations below, further explanations of each recommendation can be found in section 6.1.

Identifying & Connecting: How university-embedded innovation hubs should identify and connect with innovators depends on the hubs' goals and roles.

- Use easy-to-apply group applications with critical questions. Or use mixed approach with innovation contests, application calls, lead user method, and networking depending on situation.
- Use a staged selection process with trainings, external judges, clear criteria sent out before selection. Or identify a problem and then discuss criteria individually with different innovators.
- Use criteria suitable for the field and the type of innovator wanted. Good idea to include criteria for passion and commitment.
- If university-embedded innovation hubs want to connect with grassroots innovators on a broader scale, they should accept projects based on social problems, innovators from outside the university, help innovators from rural communities to apply, and help them where they live.

Support: How university-embedded innovation hubs can support incubatees depends on the role they want to have and on their capabilities. Below are some recommendations for how they should do it.

- Cover the inception (problem validation), protective niche (prototyping), and open market phases (scaling) in the support program. Alternatively, the open market phase can be supported by a collaborating partner hub instead.
- Fund incubatees in a way that aligns with their needs and establish partnerships and networks that can help with funding. Partnerships and networks are particularly important if the hub has limited capability to fund scaling.
- Provide the infrastructure the incubatees need to develop their prototypes (e.g., with a makerspace). But consider carefully what capabilities it should have, where it should be located, and how much incubatees will use it.
- Provide training in technical skills, soft skills, business/managerial skills, and industry knowledge to incubatees. Also, provide support with complex tasks that require too much training to learn.
- Provide useful networks for incubatees. Networks should be created to connect incubatees with stakeholders, partners, industry, and financiers. Also, consider providing recommendation letters and visibility to build trust for the incubatees.
- If university-embedded innovation hubs want to support grassroots innovation on a broader scale they should consider opening their infrastructure (e.g., makerspace) and education to the public, locate infrastructure where the grassroots live and

create local networks for the grassroots to connect. However, support with intellectual property is probably less important.

Implications for theory

This article contributes a few things to theory. The work is novel as there are no previous articles (known to the author) on how innovation hubs can support grassroots innovators, and how the support is experienced by managers and incubatees. Academics can further build on this work to understand how institutions can support grassroots innovators. Also, there are no previous articles (known to the author) on how university-embedded innovation hubs conduct their application and selection process. Furthermore, the work contributes to understand how to create an impactful and transformative hub in developing countries, as supporting grassroots innovation can lead to stronger sustainable development. The study also provides further evidence for and aligns with the findings of the reviewed literature on challenges of grassroots innovation as similar challenges to development are reported by the interviewees, for example, limited capital, lack of skills, and lack of infrastructure. The work also compares a university-embedded innovation hub and an independent innovation hub, contributing to understand their differences in roles, goals, and support practices.

There are a few limitations to the study. Although, no case study is generalisable, this study could have benefitted from more interviews. More interviews in general and interviews with incubatees from 2Scale specifically would have benefitted the study but was unobtainable due to lack of time. More interviews in general would give more data and potentially provide more valuable knowledge about the support practices, how effective they are, and how they are experienced by incubatees. Interviews with incubatees from 2Scale would allow for comparison of experiences and views of managers' and incubatees' regarding the application/selection and support functions of 2Scale. That would give a valuable triangulation to ensure 2Scale's support is received and experienced in the way they intend it to be.