SYNBEE

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1. Executive Summary

1.1 Overview of the Study

The SYNBEE project's report presents a comprehensive analysis of the synthetic biology innovation ecosystems across Europe. This study, conducted from June to October 2023, aimed to identify the factors contributing to the success of various ecosystems and to understand the challenges faced by these eco-systems. It encompassed a broad geographical scope, including both EU and non-EU countries such as the UK, Israel, Norway, and Switzerland, known for their advancements in synthetic biology. The study's methodology involved a detailed survey targeting a diverse group of stakeholders, including policymakers, academic scholars, industry experts, start-up founders and non-profit organizations.

1.2 Scope and Limitations

The research covered all fields within synthetic biology, allowing for a wide range of applications and innovations to be included. A total of 80 responses were analysed, predominantly from research and educational institutions and the industry. However, the study faced limitations such as underrepresentation of certain stakeholder groups like investors and advocacy groups, and an uneven distribution of responses favouring strong ecosystems. These factors introduced a bias in the insights, making the findings particularly relevant to the research/education and industry communities.

1.3 Main Findings from the SWOT Analysis

The SWOT analysis revealed distinct strengths, weaknesses, opportunities, and threats across the ecosystems:

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Stakeholder Group	Strengths	Weaknesses	Opportunities	Threats
Research & Educational Institutions	- Strong industry collaboration and resource availability in Lead and Strong ecosystems.	- Limited resources and less involvement in entrepreneurship in Emerging ecosystems.	- Enhancing interdisciplinary collaborations and curriculum development.	- Disparities in resource availability and support.
Big Industry, SME & Start-ups	- High levels of academia-industry collaboration and specialized infrastructure in Strong and Lead ecosystems.	- Challenges in resource support and advanced lab access in Moderate and Emerging ecosystems.	- Need for mentorship and skill development, especially in Emerging and Moderate ecosystems.	- Regulatory compliance and IP protection concerns across all ecosystems.
General Stakeholder Perspectives	- Academic excellence and diverse funding sources across ecosystems.	- Public awareness issues and funding challenges in specific research stages.	- Potential for growth in key domains like health and agriculture.	- Ethical and safety concerns, with inequality in ecosystem development.

Table 1: SWOT Analysis Summary for Stakeholder Groups in the European Synthetic Biology Sector

1.4 Key Insights and Recommendations

The SYNBEE project's findings reveal a clear stratification in Europe's synthetic biology sector. Lead and Strong ecosystems (e.g., Sweden, Austria, France, Germany) are characterized by robust resources and collaborative networks, positioning them at the forefront of innovation. Conversely, Emerging and Moderate ecosystems (e.g., Latvia, Serbia, Italy, Portugal) exhibit

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significant potential but are hindered by resource constraints and limited industry engagement. This divide necessitates strategic interventions tailored to each ecosystem's unique context.

1.4.1 Actionable Recommendations

Leveraging Collaborations in Advanced Ecosystems: For Lead and Strong ecosystems, capitalizing on existing strong industry-academic partnerships is crucial. These collaborations can be deepened through joint research projects and commercialization initiatives, fostering a cycle of innovation and practical application.

Diversifying Funding: In Strong and Lead ecosystems, the focus should be on expanding beyond traditional public funding sources. This includes exploring private investments, venture capital, and industry partnerships to create a more resilient and diversified funding landscape.

Foundation Building in Developing Ecosystems: For Moderate and Emerging ecosystems, the primary focus should be on establishing foundational elements like basic infrastructure, entry-level training programs, and initial industry connections. These foundational steps are essential for creating an environment conducive to future growth and innovation.

1.4.2 Policy Recommendations

Regulatory Harmonization: A unified regulatory framework across Europe can streamline innovation processes, making it easier for researchers and companies to navigate compliance and ethical considerations. Harmonization also aids in cross-border collaboration and standardizes safety norms.

Research Incentives Across Ecosystems: Incentives such as tax breaks, grants, and subsidies for synthetic biology research can catalyse innovation. These should be structured to benefit both established and emerging ecosystems, ensuring equitable growth.

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Support for Talent Development: Establishing scholarships, mentorship programs, and cross-institutional exchange programs can nurture a skilled workforce. Emphasis on interdisciplinary training will equip professionals with the diverse skills necessary for this rapidly evolving field.

1.5 Conclusion

The SYNBEE project delineates a multi-faceted picture of Europe's synthetic biology sector, underscored by the diversity of its innovation ecosystems. The strategic recommendations derived from this analysis aim to bridge the existing gaps, capitalizing on the strengths of each ecosystem while mitigating its weaknesses. By embracing these nuanced approaches, Europe can not only foster growth within its borders but also assert itself as a global leader in responsible and impactful innovation in synthetic biology. The key to this progression lies in integrating the diverse perspectives of all stakeholders, ensuring a holistic and forward-thinking development trajectory for the synthetic biology sector.

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2. INTRODUCTION

2.1 PURPOSE OF THE REPORT

Synthetic biology is a rapidly flourishing field with the power to change how we tackle a wide array of challenges, from healthcare to environmental issues. Europe is at the forefront of this growth, investing significantly in synthetic biology research and innovation. The SYNBEE project is key to understanding this progress, specifically focusing on how innovation in this field is supported and developed across Europe.

This report aims to conduct a thorough Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of the innovation ecosystems in synthetic biology across Europe. Our main goal is to identify what makes some ecosystems successful and leading, while others are still growing or facing challenges. Through our detailed survey questionnaire, which encompasses a diverse range of stakeholders including industry experts, academic scholars, policymakers, and non-profit organizations, we seek to gather deep insights into the fabric of these ecosystems. This report will delve into the nuances of how these stakeholders collectively contribute to and influence the synthetic biology landscape in Europe.

Our analysis is not just aimed at cataloguing the current situation but is geared towards providing actionable insights. We intend to highlight the gaps and bridge them by understanding what propels the success of thriving ecosystems. The findings are expected to be a valuable resource for policymakers, industry leaders, and researchers, offering guidance on nurturing and enhancing innovation ecosystems.

Additionally, this report will investigate the rules, ethical issues, and public concerns surrounding synthetic biology in Europe. We aim to cover the different views and challenges in this area, to help build a responsible and sustainable approach to innovation in synthetic biology.

In summary, the SYNBEE project's report is an ambitious attempt to map out the terrain of synthetic biology innovation ecosystems in Europe. It is a pursuit to understand what fuels innovation, how various ecosystems compare and contrast, and what strategies can be adopted to elevate these ecosystems to their fullest potential. This endeavour is not just about

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fostering growth in a scientific field but about paving the way for Europe to lead in responsible and impactful innovation.

2.2 Scope and Limitations

Our research encompassed a wide geographical area, reaching out to stakeholders across Europe, including non-EU countries such as the UK, Israel, Norway, and Switzerland. This selection was intentional, as these countries are leading in synthetic biology research, providing invaluable insights for our purpose. The broad European focus helps us capture a diverse range of innovation ecosystems, each at different stages of development and with unique characteristics.

The research embraced all fields within synthetic biology, not limiting itself to specific applications like medicine or environmental solutions. This broad approach allowed us to include a comprehensive range of applications and innovations within the field. Stakeholders identified for this study were meticulously categorized into various groups: policymakers, government officials, academic institutions, non-profit organizations, investors, accelerators, and industry players. Each group plays a critical role in the synthetic biology ecosystem, from shaping policies to driving commercialization and innovation.

The survey was actively disseminated and collected responses from the end of June 2023 until the end of October 2023. This timeframe provided us with a snapshot of the current state of the ecosystems, ensuring that our insights and recommendations are timely and relevant.

Our analysis included 80 responses, with a slight majority from research and educational institutions and the industry. However, there was an underrepresentation of certain stakeholder groups, such as investors and advocacy groups. This uneven distribution has led to a bias in opinions and insights. Moreover, not all ecosystems were equally represented, with a larger number of responses from stronger ecosystems. The data collection period coincided with the European holiday season, which may have affected the response rate. While we included options for qualitative input, our analysis predominantly relies on quantitative data, which could limit the depth of certain insights.

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The SWOT analysis predominantly reflects the perspectives of research/education institutions and the industry (SMEs and startups), as these groups formed most of our respondents. Although we have recorded responses from other stakeholder categories, the limited sample size from these groups meant that a comprehensive SWOT analysis for them was not feasible.

Given the skewed response rate favouring certain stakeholder groups and ecosystems, the findings and interpretations of this report are particularly relevant to the research/education and industry communities. While the insights provide valuable information, they should be contextualized within these limitations. The general questions analysed across all stakeholders offer a broader view, categorized per ecosystem, but the detailed analysis and recommendations are more reflective of the dominant respondent groups.

2.3 Background

Synthetic biology is an interdisciplinary field that merges biology, engineering, and computer science to design and build novel biological systems for a variety of applications. In recent years, Europe has emerged as a hub for synthetic biology research and innovation, with many European countries investing heavily in this field. The purpose of this literature review is to provide a comprehensive overview of the current situation and debates regarding the potential benefits of innovation in the field of synthetic biology, with a particular focus on Europe. This review has given us many themes and basis we can cover in our questionnaire to be able to identify trends and patterns in different eco-systems.

Europe is experiencing a bio-revolution with many biological innovations for complex problems in our world. Synthetic biology has the potential to revolutionize various industries, including medicine, energy, agriculture, and environmental management. For instance, synthetic biology is enabling the development of new treatments for diseases, including cancer, and the production of sustainable fuels, among others [1].

Moreover, Europe's synthetic biology market is expected to grow significantly, with estimates indicating a market value of €14 billion by 2025. The growth of this market is driven by the increasing demand for sustainable and environmentally friendly products and processes [2]. However, there are concerns regarding safety, ethics, and regulatory frameworks. While

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synthetic biology can offer many benefits, it also poses potential risks to the environment, public health, and safety [3]. As such, there is a need for robust safety and ethical guidelines to ensure that synthetic biology is used responsibly.

Europe's innovation ecosystems vary from strong and leading to moderate and emerging [13]. Strong innovation ecosystems are characterized by high levels of investment, research and development, talent, and supportive government policies. In contrast, moderate and emerging innovation ecosystems are characterized by limited investment, inadequate infrastructure, and regulatory and bureaucratic hurdles.

According to McKinsey, the bio-revolution could transform the competitive landscape, but navigating turbulent times requires strategic investments and collaborations in research, development, and commercialization [4]. The report highlights the need for partnerships and collaborations between the private and public sectors to create a thriving ecosystem for synthetic biology innovation.

To identify gaps and challenges in innovation ecosystems, a survey needs to be conducted. The European Union is working towards creating an innovation ecosystem to achieve technological sovereignty in critical technologies [5]. The European Commission's strategic approach to foster innovation in synthetic biology is based on addressing regulatory and societal challenges. The European Parliament has also highlighted the need to balance the risks and benefits of synthetic biology [6].

There are various debates and challenges in the field of synthetic biology in Europe. One of the primary challenges is ensuring the responsible use of synthetic biology. A report by the Rathenau Institute highlights the need to involve policymakers and societal stakeholders to achieve responsible innovation in synthetic biology [11]. The report notes that synthetic biology poses potential risks to the environment and public health, and there is a need to address these concerns through transparent and inclusive policymaking [7].

In the UK, a strategic plan for synthetic biology has been developed, focusing on bio-design for the bioeconomy. The plan aims to foster innovation in synthetic biology by addressing challenges related to regulation, research, and development, and education [8].

Regulatory challenges in Europe have been addressed by the European Union, focusing on the safe and responsible use of synthetic biology. The European Commission has developed a

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framework to regulate synthetic biology, which includes risk assessments, oversight mechanisms, and ethical considerations [9]. However, more needs to be done to address societal and ethical concerns, including engaging the public and stakeholders in discussions on the use of synthetic biology and its potential risks and benefits [10].

In conclusion, synthetic biology has the potential to transform multiple industries, and Europe is seen as a key player in the field. However, the ecosystem is still in its early stages, and there are significant challenges that need to be addressed, including regulatory barriers and funding gaps. The EU has recognized the potential of synthetic biology and has taken steps to support its development. However, increased investment and collaboration are needed to drive innovation and create a robust innovation ecosystem.

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3. METHODOLOGY

3.1 SURVEY DESIGN

Structure: Our survey was structured to begin with anonymous demographic questions (gender, age, workplace, role, country), followed by stakeholder-specific questions and then general inquiries relevant to all participants. The questionnaire incorporated both Likert scale and multiple-choice questions, frequently offering an 'other' option for free-text responses and choices like "none of the above" or "all of the above." At the end, participants were invited to engage further in our research, with their consent for future contact being a prerequisite.

Question Development: The survey questions, designed to be primarily closed-ended with options for additional comments, were developed based on Pew Research Center's guidelines. This process involved brainstorming sessions, extensive literature reviews, and iterative feedback from consortium partners, ensuring clarity, relevance, and unbiased content. Pilot testing led to significant refinements in the survey, including shortening its length and focusing on key questions to ensure each section could be completed within a reasonable timeframe.

Survey Sections: Our questionnaire covered a broad range of topics such as funding, recruitment, training, mentorship, lab facilities, industry-academic collaboration, policy considerations, and general opinions, providing a holistic view of the synthetic biology ecosystem.

3.2 PARTICIPANT SELECTION

The selection of participants was a meticulously conducted process, targeting a diverse range of stakeholder groups within the synthetic biology ecosystem:

1. **Government:** Including policymakers, government officials, and regulatory bodies. Their role in shaping the regulatory and legal frameworks is crucial for fostering innovation in synthetic biology.

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2. **Research and Educational Institutions**: Encompassing professors, researchers, students, and technology transfer offices. This group provides essential research infrastructure and plays a key role in the development and commercialization of new technologies.
3. **Advocacy Groups**: These entities promote the use of synthetic biology for societal benefit and often support research and development through funding and advocacy.
4. **Investors**: A critical group providing necessary funding for startups and companies, driving growth and innovation in the field.
5. **Accelerators and Incubators**: Offering support, mentorship, and resources, they help navigate the regulatory landscape and provide access to funding and expertise.
6. **Big Industry, SMEs, Start-ups**: Including CEOs and founders, this group drives innovation by developing and commercializing products and services in synthetic biology.

Each group was chosen for its unique role and contribution to the synthetic biology ecosystem, ensuring a comprehensive understanding of the field.

3.3 Data Collection and Analysis Methods

The survey was administered using the Qualtrics^{XM} platform, endorsed by TU Delft, with a focus on GDPR compliance and ethical considerations. Responses were gathered and stored securely, with distribution leveraging the networks of SYNBEE project beneficiaries and various social media platforms. The European holiday season impacted the response collection, necessitating follow-up reminders for enhanced participation.

Data normalization was employed to address the uneven distribution of responses across ecosystems, converting raw counts into percentages for balanced analysis in general questions asked to all stakeholder groups. This enabled to remove bias in opinions from more respondents from strong eco-system. Non-stacked bar charts or graphs representing the eco-systems and countries the respondents belong to were utilized for clarity, ensuring consistent application across all survey questions for individual stakeholder group categories. Open-ended responses were analysed alongside quantitative data, enriching the overall analysis with deeper insights into each stakeholder group's perspective within their ecosystems.

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4. SWOT Analysis

In this section of the report, an in-depth SWOT analysis of two prominent stakeholder groups is provided, as they constituted a significant portion of the 80 responses collected in the survey (48 responses from Educational and Research institutions and 20 responses from Big Industry, SMEs, and Start-up). Towards the end of this section, a comprehensive analysis of the general questions posed to all stakeholder groups is also presented.

4.1 Research & Educational Institutions

4.1.1 SWOT Analysis per Eco-system

The below table provides a consolidated summary of the SWOT gathered from the questions posed to respondents from the research and educational institutions stakeholder category. The SWOT insights are categorized based on respondents' eco-systems.

Ecosystem	Strengths	Weaknesses	Opportunities	Threats
Lead	Strong industry collaboration, advanced resources and infrastructure, active participation in research and entrepreneurship.	Lack of support and resources for initiating industry collaborations, limited awareness of funding amounts.	Enhancing entrepreneurship through accredited courses, leveraging existing infrastructure for more interdisciplinary projects.	Over-reliance on specific funding sources such as public or government funding (national government grants, European Union funding programs), potential underutilization of private funding.

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Ecosystem	Strengths	Weaknesses	Opportunities	Threats
Strong	Robust collaboration with industry, access to renovated labs and shared research facilities, strong focus on entrepreneurship.	Limited engagement in certain areas like international recruitment and private funding utilization.	Strengthening business planning and funding assistance, expanding the scope of private funding sources.	Potential stagnation in innovation due to funding constraints, uneven distribution of resources.
Moderate	Some level of engagement in industry collaboration and training, access to basic resources.	Limited resources compared to Lead and Strong ecosystems, less involvement in advanced entrepreneurship activities.	Increasing collaboration with industry and international institutions, enhancing training programs.	Risk of lagging behind in innovation due to resource limitations, challenges in scaling up projects.
Emerging	Active engagement in bio competitions and training programs, growing interest in synthetic biology.	Significant limitations in resources, industry collaboration, and access to advanced equipment.	Focusing on basic infrastructure development, establishing foundational training programs.	Risk of remaining underdeveloped due to resource constraints, potential brain drain due to lack of opportunities.

Table 2: SWOT Analysis for Research & Educational Institutions Stakeholder category per eco-system.

4.1.2 SWOT Analysis across all Eco-systems

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The below SWOT insights is a summary of all insights from respondents across all eco-systems belonging to research and educational institutions stakeholder category.

4.1.2.1 STRENGTHS

- **Collaboration and Networking:** Strong responses in Lead and Strong ecosystems for collaboration with industry and public engagement indicate robust networking capabilities.
- **Resource Availability:** The availability of renovated labs, industry collaborations, shared research facilities, and support for educational initiatives in Lead and Strong ecosystems.
- **Engagement in Research and Education:** High engagement in research projects, frequent interactions with experts, and a well-developed curriculum in Lead and Strong ecosystems.
- **Funding Accessibility:** Strong access to national and EU funding in the Lead and Strong ecosystems.
- **Diverse Public and Private Funding:** A range of public funding options and private funding, including venture capital and diverse sources in the Lead ecosystem.

4.1.2.2 WEAKNESSES

- **Limited Resources in Emerging Ecosystems:** Notable limitations in resources, especially in industry collaboration and shared research facilities, in the Emerging ecosystem.
- **Insufficient Training and Support:** Perceived lack of regulatory affairs training, business planning, and marketing support.
- **Funding Uncertainty:** A general lack of clarity regarding the amounts of public funding available across all ecosystems.

4.1.2.3 OPPORTUNITIES

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- **Expanding Interdisciplinary Collaborations:** Opportunities to enhance interdisciplinary collaborations, as indicated by strong responses in the Lead ecosystem.
- **Curriculum and Training Development:** Potential to develop more comprehensive educational materials, entrepreneurship courses, and internships.
- **International Talent Recruitment:** Opportunities to address local talent shortages by recruiting international students and researchers.
-

4.1.2.4 THREATS

- **Perception of Collaboration's Lack of Benefit:** Some responses in the Lead ecosystem indicate a perception of no benefit in industry engagement.
- **Talent Attraction and Retention:** Challenges in attracting and retaining talent in synthetic biology, as evidenced by occasional recruitment of international talent.
- **Uneven Resource Distribution:** Disparities in resource availability and support across different ecosystems, particularly between Lead/Strong and Emerging ecosystems.

4.1.3 SUMMARY OF RESPONSES AND KEY TAKEAWAYS

- There is a clear divide in resource availability, collaboration opportunities, and educational support between Lead/Strong and Emerging ecosystems.
- Lead and Strong ecosystems exhibit strong industry-academic collaboration and are better resourced in terms of facilities and funding.
- Emerging ecosystems face challenges in resource availability and industry collaboration, indicating a need for targeted support and development strategies.
- There is an overall lack of clarity regarding funding amounts, which suggests the need for better communication and transparency in funding processes.
- The engagement in entrepreneurship and interdisciplinary research is a positive trend, but there is room for improvement in areas like regulatory affairs, business planning, and marketing support.

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4.1.4 Diverse Stakeholder Perspectives

- **Industry Collaboration:** Varied responses across ecosystems suggest differing perceptions of the value and benefits of industry collaboration.
- **Educational Support:** Responses indicate a consensus on the importance of practical training programs, mentorship, and industry involvement in curriculum design.
- **Funding:** The variety in responses regarding funding sources reflects the diverse funding landscapes in different ecosystems. The Lead ecosystem shows a wider range of active private funding options.
- **Talent Recruitment**: The occasional need to recruit international talent highlights the varying levels of local talent availability and the potential for enhancing local talent development programs.

In summary, the synthetic biology sector in Europe displays strong collaboration and resource availability in Lead and Strong ecosystems but faces challenges in Emerging ecosystems. Opportunities for enhancing educational support, interdisciplinary collaborations, and international talent recruitment are evident. The sector must address perceived gaps in training, uneven resource distribution, and funding clarity to maintain its growth trajectory and innovation potential.

4.2 Big-Industry, SME, Start-ups

4.2.1 SWOT Analysis per Eco-system

This SWOT analysis for each ecosystem provides a clear picture of the current state of synthetic biology in these regions, highlighting their respective strengths, weaknesses, opportunities, and threats. While Strong and Lead ecosystems show robust infrastructure and collaborative efforts, Emerging and Moderate ecosystems present opportunities for growth amid resource and support challenges.

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Ecosystem	Strengths	Weaknesses	Opportunities	Threats
Lead (Sweden)	- Significant discussions for initiating collaborations. - Access to advanced facilities like bio foundries. -Demonstrated capacity for innovation in synthetic biology.	- Some challenges in acquiring diverse funding sources. - Talent recruitment can be an issue.	- Opportunity to be a model ecosystem in synthetic biology. - Potential for expanding mentorship and training programs.	- Regulatory compliance and IP protection issues. - Balancing innovation with sustainable development.
Strong (e.g., Austria, France, Germany)	- High levels of academia-industry collaboration. - Availability of specialized infrastructure and renovated labs. - Diverse funding sources.	- Still some concerns about regulatory and IP barriers. - Challenges in talent acquisition in certain areas.	- Capacity for leading synthetic biology innovation. - Potential for mentorship and interdisciplinary training programs.	- Financial risks and complexities in investment. - Need for sustainable internal funding mechanisms.
Moderate (e.g., Italy, Portugal)	- Few joint projects and discussions for collaboration. - Access to some advanced lab facilities. - Specific training needs	- Interest in collaboration but lack support/resources. - Varied access to state-of-the-art facilities. - Limited access to funding and resources.	- Opportunities for mentorship and entrepreneurship education. - Potential market for growth and collaboration.	- Regulatory and IP challenges. - Talent gap and dependency on external expertise.

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Ecosystem	Strengths	Weaknesses	Opportunities	Threats
	identified (e.g., lab to consumer integration).			
Emerging (e.g., Latvia, Serbia)	- Initial discussions for collaborations. - Renovated labs with specialized equipment.	- Limited advanced facilities. - Less engagement in joint projects. - Occasional need to seek foreign expertise.	- Potential for developing synthetic biology sectors. - Need for mentorship and training programs.	- Financial risks in innovation. - Scarcity of local talent and resources.

Table 3: SWOT Analysis for Big-Industry, SME, Start-ups Stakeholder category per eco-system.

4.2.2 SWOT Analysis across all Eco-systems

This SWOT analysis from all questions posed to the Big-Industry, SMEs and Start-ups stakeholder category aims to the gather insights from all respondents across all eco-systems.

4.2.2.1 Strengths

Strong Ecosystems (e.g., Austria, France, Germany): Demonstrated high levels of collaboration with academia and access to specialized infrastructure, indicating a robust environment for synthetic biology.

Lead Ecosystem (Sweden): Showed significant engagement in discussions to initiate collaborations and access to advanced facilities like bio foundries.

4.2.2.2 Weaknesses

Emerging Ecosystems (e.g., Latvia, Serbia): Limited resources, including basic lab facilities and lesser engagement in collaborative projects, indicate a need for infrastructure development.

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Moderate Ecosystems (e.g., Italy, Portugal): Showed interest in collaborations but faced challenges in resource support and access to advanced labs, highlighting a gap in resource availability.

4.2.2.3 OPPORTUNITIES

Emerging and Moderate Ecosystems: Expressed a need for mentorship and entrepreneurial skill development, suggesting potential for targeted training programs.

Moderate Ecosystem (Italy): Indicated specific needs like integration from lab to consumer, presenting opportunities for tailored support and development programs.

4.2.2.4 THREATS

General Across Ecosystems: Concerns about regulatory compliance and IP protection are common, potentially hindering innovation.

Emerging Ecosystems: The perception of financial risks and limited access to funding sources can be a deterrent to growth and development in synthetic biology.

4.2.3 SUMMARY OF RESPONSES AND KEY TAKEAWAYS

Industry-Academia Collaboration: Strong and Lead Ecosystems exhibited a higher degree of collaboration, essential for knowledge exchange and practical application. Emerging and Moderate Ecosystems showed enthusiasm for collaboration but faced resource-related challenges.

Infrastructure and Resource Availability: Strong and Lead Ecosystems benefited from advanced facilities and diversified funding sources. Emerging and Moderate Ecosystems reported limited access to state-of-the-art facilities, indicating a need for infrastructure investment.

Talent and Training Needs: A cross-ecosystem need for enhanced mentorship, interdisciplinary collaboration, and entrepreneurial training was evident. Moderate Ecosystems (e.g., Portugal) specifically mention of training gaps like integration of value chains points to unique local needs.

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Funding Landscape: Strong and Lead Ecosystems demonstrated a variety of funding avenues, showing a healthy funding ecosystem. Emerging and Moderate Ecosystems indicated reliance on external funding, highlighting the need for more sustainable funding mechanisms.

Regulatory and IP Barriers: These challenges were universally acknowledged, affecting innovation pace and investor confidence.

Growth Opportunities in Emerging Markets: Emerging and Moderate Ecosystems showed a keen interest in synthetic biology development, presenting opportunities for investment and collaboration.

4.2.4 Diverse Stakeholder Perspectives

Stakeholder perspectives are varied across ecosystems. The challenges of different stages of development in synthetic biology innovation was highlighted across Europe, suggesting a need for tailored strategies.

Qualitative Insights from Moderate Ecosystems provided specific insights into local challenges and needs, such as timing in market entry and specific training needs, offering valuable guidance for targeted support.

In summary, while Strong and Lead ecosystems exhibit robust collaboration and resource availability, Emerging and Moderate ecosystems face significant challenges in these areas. Opportunities for growth and development in Emerging and Moderate ecosystems are evident, contingent on addressing the existing gaps in resources, training, and regulatory frameworks.

4.3 General Questions for All Stakeholder Categories

4.3.1 SWOT Analysis per eco-systems

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The table below presents the SWOT analysis gathered from general questions posed to all stakeholder groups from all eco-systems. The analysis below is categorised per eco-system for clarity and to understand the differences in successes and challenges faced by the innovation eco-systems in the field of Synthetic biology.

Ecosystem	Strengths	Weaknesses	Opportunities	Threats
Lead	Academic Expertise, Skilled Labor Force, Well-funded Research Initiatives	Lack of Public Awareness, Funding Challenges, Regulatory Hurdles	Optimism in Health and Agriculture, Public Engagement	Ethical and Safety Concerns, Inequality in Ecosystem Development
Strong	Academic and Research Funding, Skilled Labor, and Government Support	Private Funding Opportunities, Public Awareness and Ethical Concerns	Future Collaboration, Growth in Key Domains	Regulatory Barriers, Variations in Funding and Collaboration Models
Moderate	Skilled Labor, Academic Excellence	Public Funding Issues, Lack of Public Awareness	Public Engagement, Diverse Funding Sources	Regulatory and Ethical Challenges, Funding Disparities
Emerging	Academic Expertise, Skilled Labor, Vibrant Startup Ecosystem	Funding Gaps, Educational Program Gaps	Potential for Growth, Collaboration and Public Engagement	Ethical and Safety Concerns, Lack of Government Support

Table 4: SWOT Analysis for general questions to all Stakeholder category per eco-system.

4.3.2 SWOT Analysis across all eco-systems

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4.3.2.1 STRENGTHS

- **Academic Excellence and Research Initiatives:** Strong academic institutions are a clear strength, especially in the Lead (37%) and Strong (37%) ecosystems. This is complemented by well-funded research initiatives (Lead: 19%, Strong: 14%).
- **Skilled Labor Force**: A significant proportion of respondents in the Moderate (32%) and Emerging (22%) ecosystems identified the availability of a skilled labour force as a key strength.
- **Diverse Funding Sources:** National government agencies and the European Commission are consistently significant funding sources across ecosystems, averaging around 33% and 27% respectively.
- **Collaboration Opportunities:** The Lead ecosystem shows multiple R&D collaborations with academic institutions (56%), indicating strong ties between academia and industry.

4.3.2.2 WEAKNESSES

- **Lack of Public Awareness**: Particularly noted in the Lead ecosystem with 24% identifying it as a significant challenge.
- **Funding Challenges in Specific Research Stages**: Validation and Growth/Scale-up stages are seen as challenging across various ecosystems (Strong: Validation 22%, Growth 22%; Moderate: Validation 22%, Growth 19%).
- **Regulatory Hurdles**: A considerable number of respondents across ecosystems perceive government regulations as a barrier in areas like funding opportunities and licensing processes.

4.3.2.3 OPPORTUNITIES

- **Growth in Key Domains:** High optimism about future domains such as human health (Emerging: 67% highly promising) and agriculture (Lead: 50% highly promising).
- **Enhancing Public Engagement**: Opportunities to improve public understanding are evident, with a need for more public events (Moderate and Emerging: 18% each) and educational materials (12-15% across ecosystems).

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- **Potential for Increased Collaboration**: Notable interest in future collaborations, especially in the Strong (27%) and Emerging (33%) ecosystems, indicating potential for increased academic-industry partnerships.

4.3.2.4 THREATS

- **Ethical and Safety Concerns:** Recognized as challenges, particularly in the Lead (17%) and Strong (16%) ecosystems.
- **Inequality in Ecosystem Development**: Variations in ecosystem development pose a threat to the uniform growth of the synthetic biology sector across Europe.
- **Disparities in Funding and Collaboration Models**: Variations in the perception of funding challenges (e.g., Lead: Basic Science Research 22%, Growth 22%) and collaboration models (e.g., Lead: Multiple R&D collaborations 56%) across ecosystems.

4.3.3 SUMMARY OF RESPONSES AND KEY TAKEAWAYS

4.3.3.1 GENERAL TRENDS AND PERCEPTIONS

- **Broad Optimism Across Domains**: There's a notable optimism about the future of synthetic biology, especially in domains like human health and performance, which a majority in the Emerging ecosystem (67%) find highly promising. However, this optimism varies across ecosystems.
- **Regulatory and Funding Challenges**: Regulatory hurdles and funding issues are prominent concerns across ecosystems, but the perception of their impact varies. For instance, the Moderate ecosystem finds funding for Basic Science Research (39%) particularly challenging, while the Emerging ecosystem is more concerned about Growth or Scale-up (27%).

4.3.3.2 ECOSYSTEM-SPECIFIC INSIGHTS

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- **Lead Ecosystem**: Exhibits concerns about public awareness and showcases strengths in academic expertise. There's also an emphasis on the need for interdisciplinary collaboration.
- **Strong Ecosystem**: Highlights professional conferences as a means of enhancing public engagement and perceives government regulations and ethics as significant challenges.
- **Moderate Ecosystem**: Emphasizes the need for foundational support in funding and shows a high concern for public awareness.
- **Emerging Ecosystem**: Demonstrates an eagerness for future collaborations and shows high optimism for new domains in synthetic biology.

4.3.3.3 Collaboration and Public Engagement

Varied Collaboration Models: Different ecosystems have distinct approaches to collaboration with academia. The Lead ecosystem, for instance, has a high rate of multiple R&D collaborations, indicating a mature partnership model.

Public Awareness and Education: Recognized as a key area for improvement, the approaches to enhancing public awareness and education in synthetic biology need to be tailored to the specific needs and context of each ecosystem.

4.3.4 Quantitative and Qualitative Analysis

- **Funding and Collaboration**: The survey indicates disparities in funding sources and collaboration opportunities across ecosystems. For example, while national government agencies and the EC are the main funders, their impact varies across ecosystems.
- **Perception of Regulatory Environment**: There's a general perception across ecosystems that government regulations somewhat hinder innovation, particularly in areas like funding opportunities and licensing processes.
- **Diverse Stakeholder Opinions**: Stakeholders from different ecosystems offer unique perspectives. For instance, respondents from the Emerging ecosystem emphasize the

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need for general education and research funding, while those from the Lead ecosystem highlight interdisciplinary collaboration as a key strength.

- **Specific Suggestions and Concerns**: Unique suggestions include the need for more professional conferences in the Strong ecosystem and addressing political challenges in the Lead ecosystem.

4.3.5 Diverse Opinions and Stakeholder Perspectives

4.3.5.1 Across Ecosystems

- **Optimism in Emerging Fields**: While optimism about synthetic biology's potential is widespread, it's particularly notable in the Emerging ecosystem with 67% seeing human health and performance as highly promising. This contrasts with more cautious optimism in other ecosystems.
- **Regulatory Perspectives:** There's a notable variation in how ecosystems perceive regulatory hindrances. For instance, in the Emerging ecosystem, 54% believe policymakers are unaware of synthetic biology's benefits, whereas in the Strong ecosystem, this perception drops to 26%.

4.3.5.2 Funding and Collaboration

- **Funding Challenges**: Different ecosystems have varied perceptions of funding difficulties. The Moderate ecosystem, for example, finds Basic Science Research (39%) and Applied Early-Stage Research (22%) as most challenging to fund, suggesting a need for more foundational support.
- **Collaboration Models:** There are differences in how ecosystems engage with academia. The Lead ecosystem shows a strong inclination towards multiple R&D collaborations (56%), indicating a well-established partnership model, whereas the

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Emerging ecosystem expresses a higher interest in future collaborations (33%), suggesting an emerging collaborative environment.

4.3.5.3 STAKEHOLDER-SPECIFIC PERSPECTIVES

- **Public Awareness and Education**: The need for improved public awareness and education is a common theme, but the approach may differ. The Moderate and Emerging ecosystems emphasize the need for more media information, while the Lead ecosystem suggests a focus on interdisciplinary collaboration.
- **Unique Suggestions**: Stakeholders offer ecosystem-specific suggestions, like the emphasis on professional conferences in the Strong ecosystem or addressing political challenges in the Lead ecosystem.

4.3.5.4 ETHICAL AND SAFETY CONSIDERATIONS

- **Varied Concerns**: Ethical and safety concerns are more pronounced in certain ecosystems (Lead: 17%, Strong: 16%) compared to others, reflecting differing societal and regulatory contexts.

In conclusion, the survey responses reveal a tapestry of opinions and perspectives across different European ecosystems in synthetic biology. These range from varying levels of optimism and perceived challenges to differences in funding, regulatory perceptions, and collaboration models. Such diversity underscores the complexity of the synthetic biology landscape in Europe and highlights the importance of considering these differing viewpoints in policymaking, funding strategies, and collaborative efforts.

5. STRATEGIC RECOMMENDATIONS

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5.1 Actionable Strategies

5.1.1 For Lead and Strong Ecosystems

- **Leverage Existing Collaborations**: Enhance industry-academic partnerships to foster innovation and practical application.
- **Utilize Diverse Funding Sources**: Encourage exploration of private funding alongside public sources to diversify financial support.
- **Expand Entrepreneurship Education:** Incorporate accredited courses and interdisciplinary projects to nurture entrepreneurial skills.
- **Address Funding Clarity and Regulatory Challenges**: Improve communication about funding and simplify regulatory processes to facilitate innovation.

5.1.2 For Moderate and Emerging Ecosystems

- **Develop Basic Infrastructure and Training Programs**: Focus on foundational development like labs and basic training to build a strong base for synthetic biology.
- **Enhance International Collaborations and Talent Recruitment**: Utilize global networks to overcome local talent and resource limitations.
- **Promote Public Engagement and Awareness**: Increase efforts in public outreach and education to raise awareness and support for synthetic biology.

5.2 Policy Recommendations

- **Foster Regulatory Harmonization**: Streamline regulatory frameworks to ease compliance and promote innovation.
- **Incentivize Research and Development**: Provide tax incentives and grants specifically targeting synthetic biology research and start-up development.
- **Support Talent Development:** Establish programs and scholarships to nurture local talent and reduce reliance on international recruitment.

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7 CONCLUSION

The SYNBEE project's comprehensive study, encompassing diverse European ecosystems within the realm of synthetic biology, provides a nuanced understanding of the field's current state and potential pathways for growth. This report, through its meticulous research and analysis, has highlighted the heterogeneity of the synthetic biology landscape across Europe, marked by varying degrees of innovation, collaboration, and resource allocation.

Key to the study's findings is the clear demarcation between Lead and Strong ecosystems, such as Sweden and Germany, which demonstrate robust academic-industry partnerships and advanced infrastructural capabilities, and the Moderate and Emerging ecosystems, like Italy and Latvia, which, while showing potential, are constrained by resource limitations and infrastructural gaps. This disparity underscores the need for tailored strategies and interventions that not only foster growth and innovation in less developed ecosystems but also sustain and enhance the advancements in more established ones.

The SWOT analysis, a cornerstone of this study, has successfully captured the dynamic interplay of strengths, weaknesses, opportunities, and threats within each ecosystem, providing stakeholders with a detailed map to guide strategic decisions. From the strong industry collaborations in Lead ecosystems to the need for foundational development in Emerging ones, the analysis offers a clear direction for future endeavours in the synthetic biology sector.

Furthermore, the policy recommendations presented in this report, emphasizing regulatory harmonization, research incentives, and talent development, are poised to create a more cohesive and supportive environment for synthetic biology across Europe. These recommendations, if effectively implemented, have the potential to transform the landscape, making Europe a global leader in responsible and impactful innovation in synthetic biology.

7.2.1 FUTURE OUTLOOK

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Growth Potential in Emerging and Moderate Ecosystems: With targeted support, these ecosystems can significantly contribute to Europe's synthetic biology landscape. Innovation Continuity in Strong and Lead Ecosystems: Expected to maintain their leading roles, these ecosystems can drive advancements and serve as models for others. Collaboration and Networking: Emphasizing these aspects can lead to breakthroughs in synthetic biology, benefiting the sector. Policy and Funding Strategies: The need for adaptable and supportive policies and diverse funding strategies is crucial to address the unique needs of each ecosystem.

In summary, the synthetic biology sector in Europe is poised for growth and innovation, provided the challenges are addressed through strategic support, policy reform, and collaborative efforts. The sector's future is bright, with opportunities for development across all ecosystems, backed by strong research, educational institutions, and industry support.

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6. APPENDICES

6.1 SURVEY ANALYSIS WITH DATA TABLES AND CHARTS

In this section of the report, each stakeholder group's questions are detailed with the respondents' answers represented with a graph. The responses are then summarised following text with any interpretations and conclusions related to the data.

6.1.1 QUESTIONS

6.1.1.1 STAKEHOLDER GROUP GOVERNMENT

1. *How does your country's government support synthetic biology start-ups to boost innovation? Please select all that apply:*

a. By providing funding and grant opportunities.
b. By providing tax incentives for investors (if possible, please specify any improvements that could be made to these incentives to better support equity financing).
c. By creating regulatory frameworks that promote innovation and growth (please provide an example).
d. By providing guidance and support on compliance with relevant laws and regulations (please specify which laws and regulations, and any improvements that could be made to the guidance).
e. By establishing and supporting incubators and accelerator programs.
f. Strategy and policy preparation with relevant stakeholders
g. Allocation of resources for entrepreneurship training and other relevant competence development activities.
h. None of the above.
I. Other (please specify)

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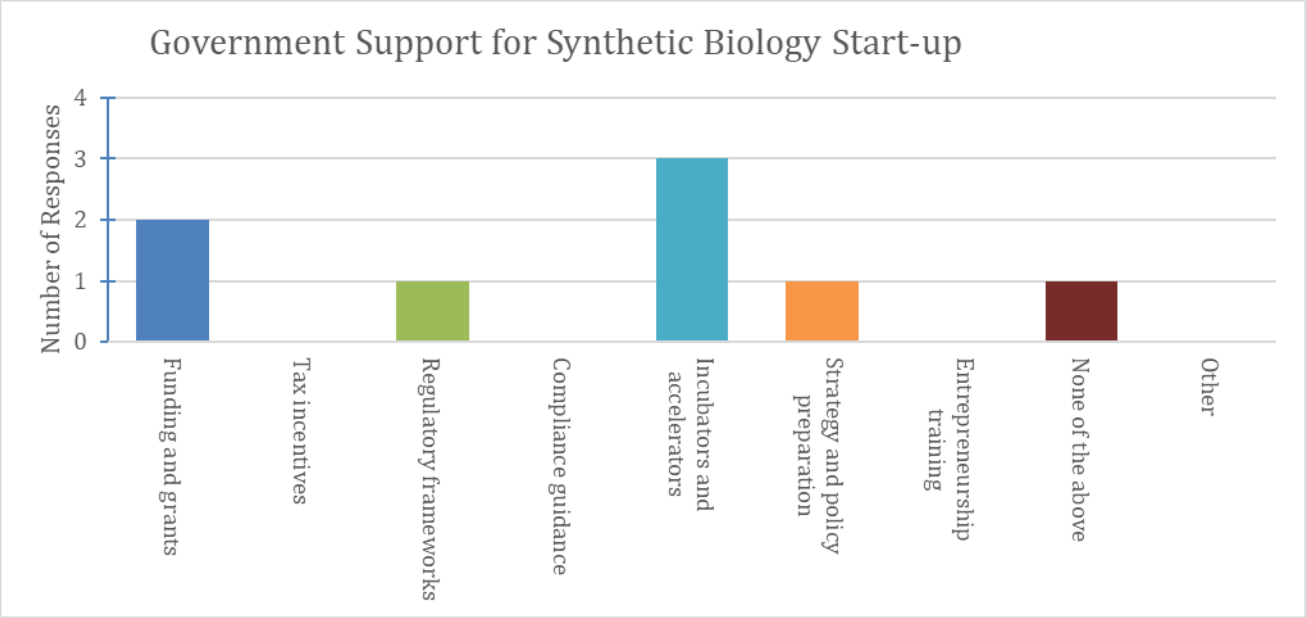

Figure 1 Government Support for Synthetic Biology Start-up

The survey responses from participants in Latvia, Italy, and France highlight varying levels of government support for synthetic biology start-ups. In Latvia, responses were polarized; one respondent reported no support from the government, while another detailed a range of support mechanisms, including funding opportunities, regulatory frameworks promoting innovation (RIS3), support for incubators and accelerators, and engagement in strategy and policy preparation. From Italy, the government support was identified solely in the provision of incubators and accelerator programs. Similarly, the respondent from France cited government support in the form of funding opportunities and the establishment of incubators and accelerator programs. Notably, there were no mentions of tax incentives, compliance guidance, or entrepreneurship training among the responses from these three countries.

2. What kind of policies or regulations do you think are currently lacking but necessary to support the growth of synthetic biology start-ups in your country? Please select up to three most important choices.

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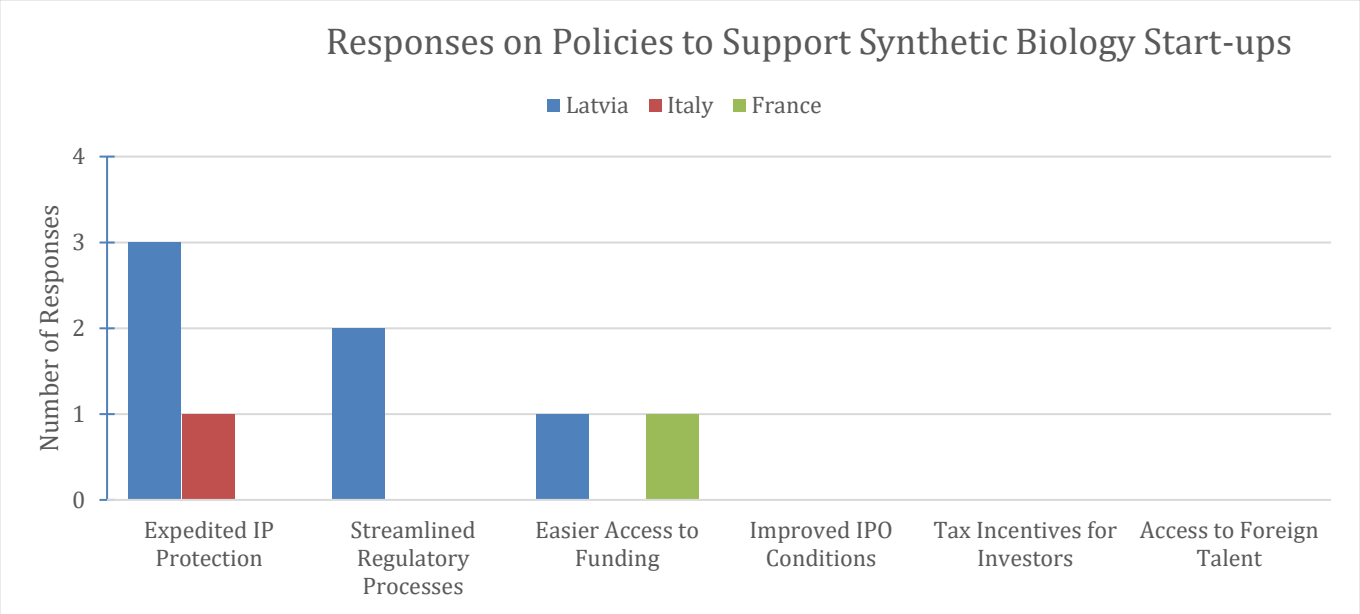
a. Expedited intellectual property protection for innovators, such as copyrights, trademarks, patents.
b. Streamlined regulatory processes to make market entry easier.
c. Easier and timely access to substantive funding for innovation and entrepreneurs.
d. Tax incentives for investors such as tax breaks for R&D, reduced corporate tax rates for synthetic-biology start-up companies.
e. Improved conditions for Initial Public Offerings (IPO's) to allow a more secure and easier exit for investors.
f. Simplified and streamlined access to foreign talent.
g. None of the above
h. I don't know.
i. Other (please specify)



Expedited Intellectual Property Protection is viewed as a significant requirement, especially in Latvia and to some extent in Italy. Streamlined Regulatory Processes are also considered important, particularly in Latvia. Easier Access to Funding is noted as a need in both Latvia and France. Improved IPO Conditions, Tax Incentives for Investors, and Access to Foreign Talent were not selected by any respondents.

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6.1.1.2 STAKEHOLDER GROUP: INVESTORS

The survey on synthetic biology startups received detailed responses from a single investor, a key stakeholder in this domain. This investor, in the 55-64 age bracket and based in Finland, works at Evok Ventures, a company with fewer than 10 employees primarily focusing on early-stage startups. She highlighted the management team's experience, the innovativeness of the technology, the product's market potential, and the intellectual property portfolio as crucial factors for investment decisions. The location of a company was deemed moderately important by her.

A significant deterrent for investment, as identified by the respondent, is the long development time of products. In Finland, the biggest challenge in investing in synthetic biology startups, according to her, is the limited access to talented individuals. Additionally, she noted a lack of streamlined regulatory processes to facilitate market entry for startups.

The investor pointed out that many seeking investment lack a clear commercialization plan for their companies, making them less attractive to investors. Essential supports and resources needed in Finland, as per her observations, include expert guidance, talent acquisition, regulatory support, adequate infrastructure, and marketing. Interestingly, the immediate need for funding and investment was considered slightly less crucial by her.

Further survey questions revealed that business planning is critical in a startup's early stages, mentorship and networking are vital for developing entrepreneurial skills among students, and personal introductions and referrals are key in connecting startups with potential investors. These responses underscore a practical and strategic approach to entrepreneurship and business development within the synthetic biology sector, as seen through her perspective.

6.1.1.3 STAKEHOLDER GROUP: ACCELERATOR & INCUBATOR

Demographics

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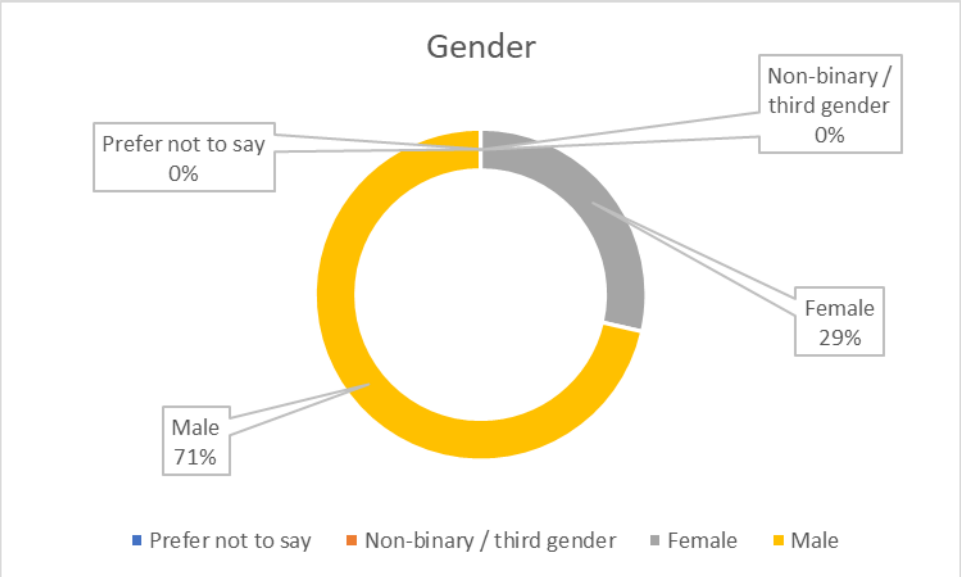
1. Gender of the respondents



2. Countries of the respondents

3. Name of the workplace

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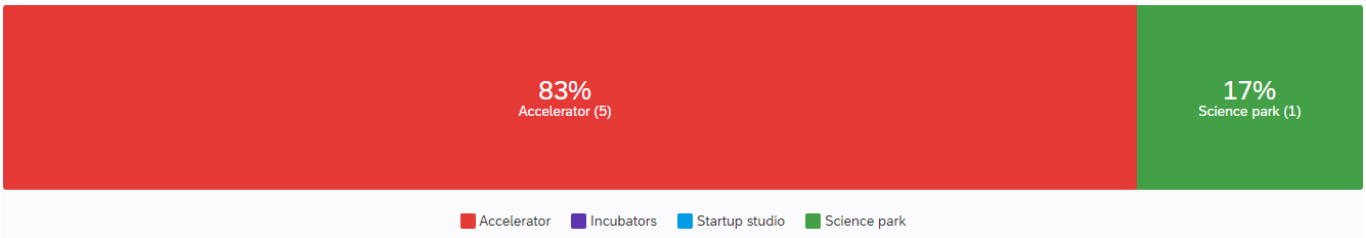
Gender	Female	Male	Male	Male	Male
How old are you?	25-34 years old	18-24 years old	18-24 years old	45-54 years old	45-54 years ol
List of Countries	Latvia	Germany	Germany	France	France
What is the name of your workplace?	Buildit Accelera	iGEM Foundation	iGEM Foundation / iGI	BIOASTER	ShakeUpFacto
Which of the following best describes your current workplace?	Accelerator, Inc	Accelerator, Incubato	Accelerator, Incubato	Accelerator, Inc	Accelerator, Ir
How many employees are working in synthetic biology at your institution?	less than 10	50-500	10-50	less than 10	less than 10
Please choose the option which best represents your institution? - Accelerator	Accelerator		Accelerator	Accelerator	Accelerator
Please choose the option which best represents your institution? - Incubators					
Please choose the option which best represents your institution? - Startup studio					
Please choose the option which best represents your institution? - Science park		Science park			

4. Stakeholder sub-category of the respondents



Questions

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1. *How does your country's government support synthetic biology start-ups to boost innovation? Please select all that apply:*
   a. *By providing funding and grant opportunities.*
   b. *By providing tax incentives for investors (if possible, please specify any improvements that could be made to these incentives to better support equity financing).*

      _____

   c. *By creating regulatory frameworks that promote innovation and growth (please provide an example).*

      _____

   d. *By providing guidance and support on compliance with relevant laws and regulations (if possible, please specify which laws and regulations, and any improvements that could be made to the guidance).*

      _____

   e. *By establishing and supporting incubators and accelerator programs to help start-ups grow and succeed (if possible, please provide details on how these programs are established and supported, their impact on start-ups, and any need for further support such as grants or tax incentives).*

      _____

   f. *Strategy and policy preparation with relevant stakeholders*
   g. *Allocation of resources for entrepreneurship training and other relevant competence development activities*
   h. *None of the above.*
   i. *Other (please specify)*

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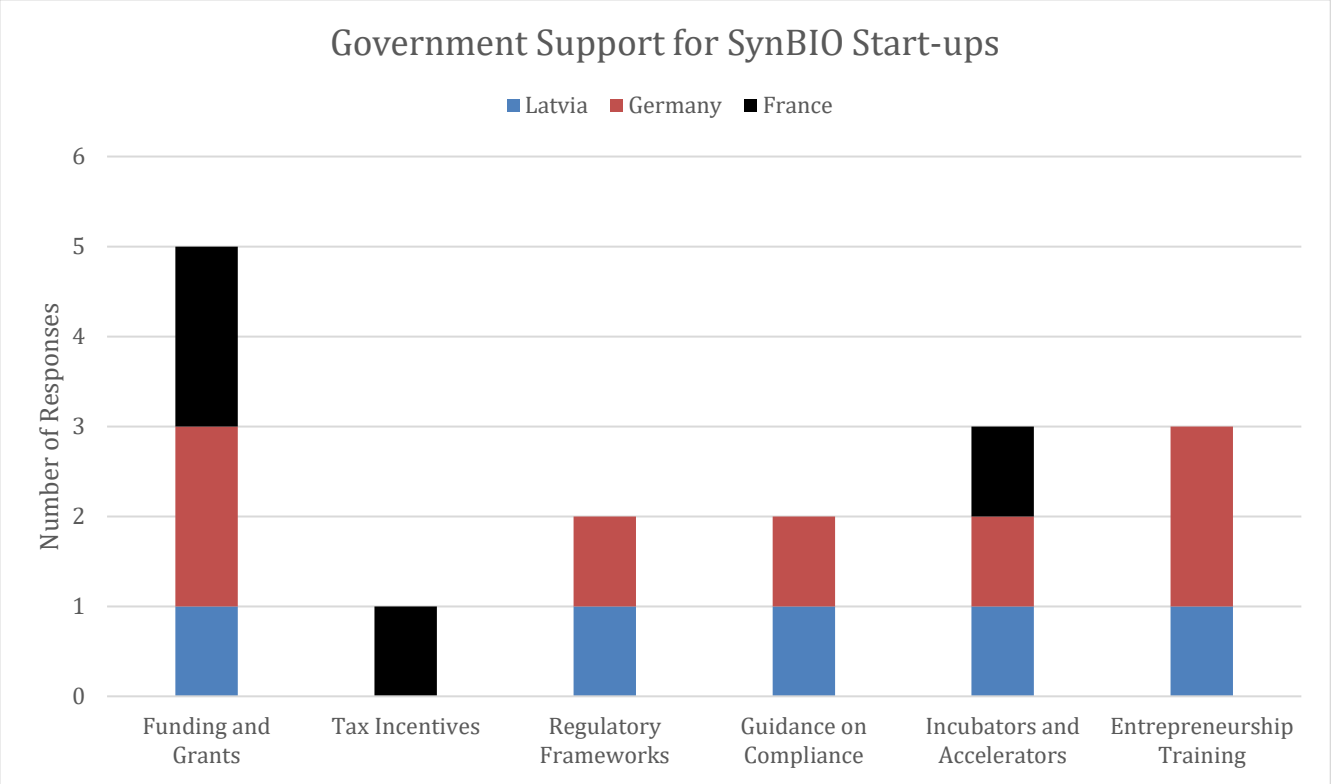

The analysis of government support for synthetic biology startups across Latvia, Germany, and France reveals a diverse range of approaches. All countries, in at least one of their responses, emphasized the importance of providing funding and grant opportunities, underscoring this as the most common and crucial form of support. Interestingly, France uniquely highlighted the provision of tax incentives for investors, an aspect not mentioned by the other countries. Regulatory frameworks that promote innovation and growth were also recognized as vital, with Latvia and one of the German responses pointing to this. The role of guidance on compliance with relevant laws and regulations was similarly noted by Latvia and Germany, indicating an awareness of the need for legal and regulatory support in the startup ecosystem.

Additionally, the establishment of incubators and accelerator programs was identified as a key support strategy by Latvia, Germany, and France. These programs are essential in fostering the growth and success of emerging startups. Furthermore, the allocation of

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resources for entrepreneurship training and competence development activities was a common theme in the responses from Latvia and Germany. This indicates a recognition of the importance of equipping entrepreneurs with the necessary skills and knowledge for success.

2. *What kind of policies or regulations do you think are currently lacking but necessary to support the growth of synthetic biology start-ups in your country? Please select up to three most important choices:*
   a. Expedited intellectual property protection for innovators, such as copyrights, trademarks, patents.
   b. Streamlined regulatory processes to make market entry easier.
   c. Easier and timely access to substantive funding for innovation and entrepreneurs.
   d. Tax incentives for investors such as tax breaks for R&D, reduced corporate tax rates for synthetic-biology start-up companies.
   e. Improved conditions for Initial Public Offerings (IPO's) to allow a more secure and easier exit for investors.
   f. Simplified and streamlined access to foreign talent.
   g. None of the above
   h. Other (Please specify)

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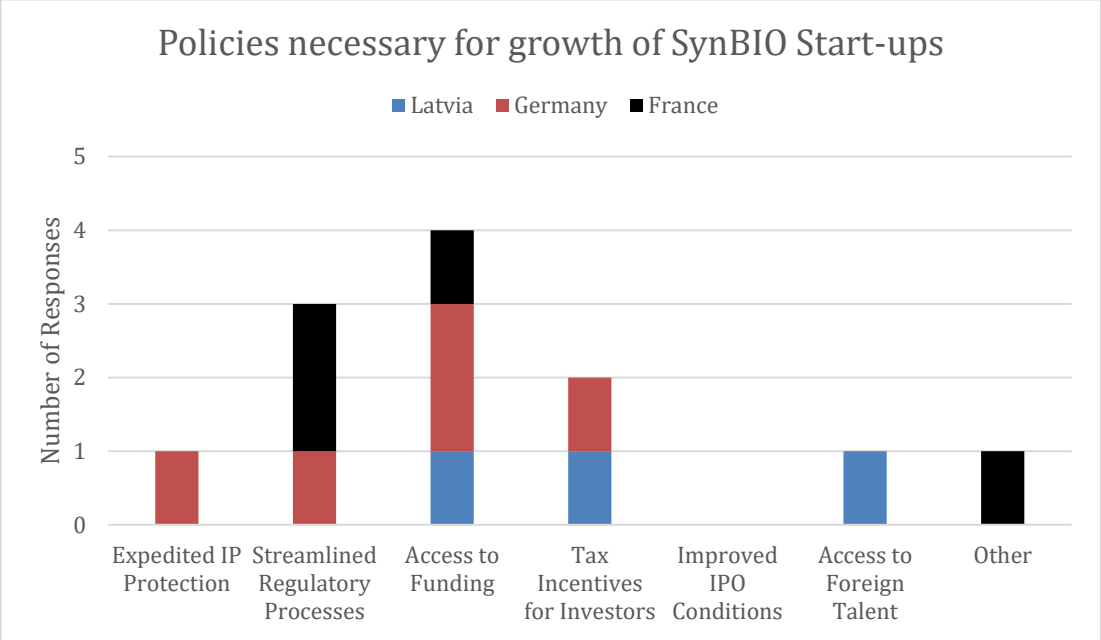

The survey responses from Latvia, Germany, and France provide insights into the perceived gaps in policies and regulations for synthetic biology startups. A notable emphasis was placed on the need for easier and timely access to substantive funding for innovation and entrepreneurs, a choice highlighted by Latvia, Germany, and France. This underscores the critical role of financial support in the startup ecosystem.

Another significant area identified was the need for streamlined regulatory processes to facilitate easier market entry, a choice indicated by both German and French responses. This suggests a shared concern about the complexities and potential barriers within the existing regulatory framework.

The German responses, along with Latvia, also highlighted the importance of tax incentives for investors, including tax breaks for R&D and reduced corporate tax rates for synthetic biology startup companies. This reflects a recognition of the role that fiscal policy can play in encouraging investment in this sector.

3. *Which of the below allow synthetic biology start-ups to better connect with investors and funding opportunities in your country? Select all that apply:*
   a. Through networking events and conferences

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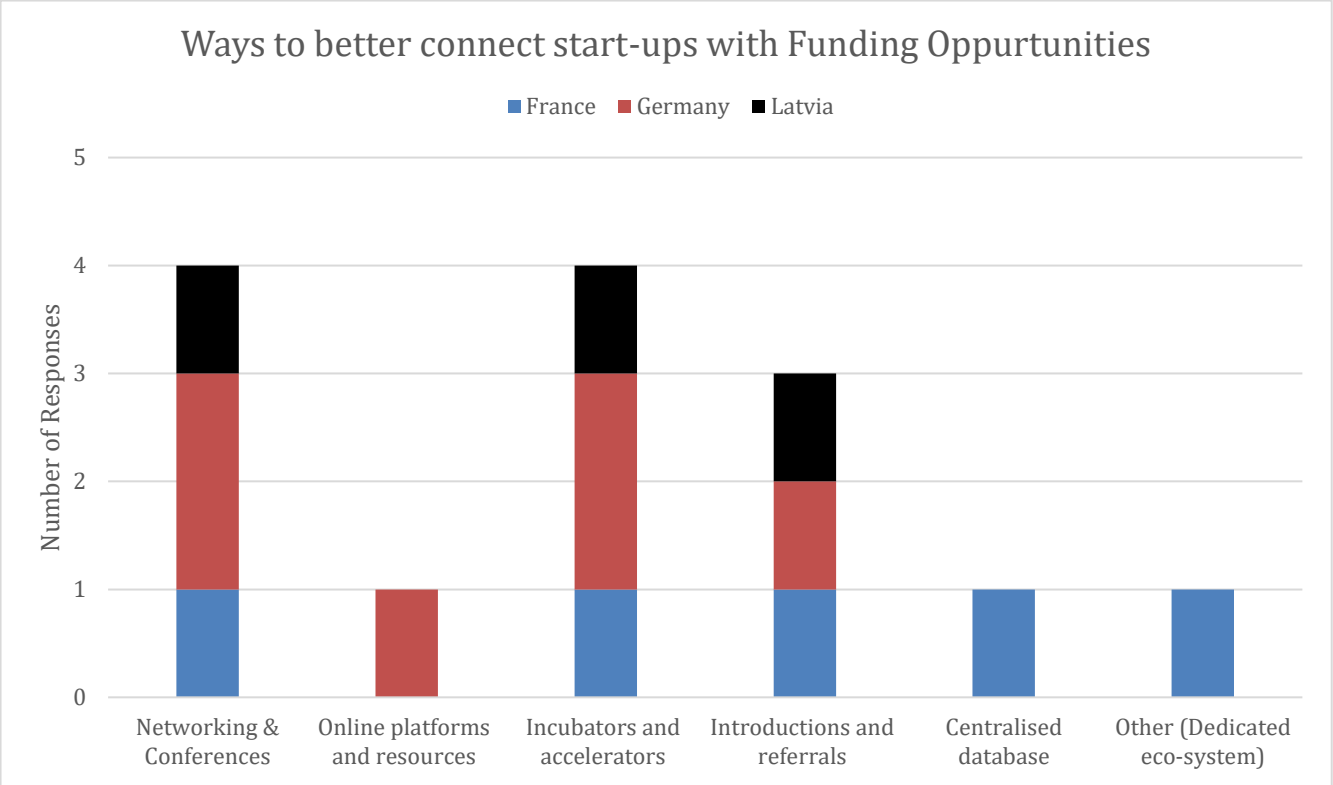
b. Through online platforms and resources
c. Through incubators and accelerators
d. Through introductions and referrals
e. Through a centralised platform with information regarding all funding opportunities.
f. Other (please specify)
g. Would you like to see a particular method added or developed for this purpose, please specify:



Networking events and conferences emerged as a popular choice across all participating countries, with Germany exhibiting the strongest preference for this approach. The use of online platforms and resources appeared to be less favoured, with only one response from Germany indicating interest in this option. Incubators and accelerators received notable attention in Latvia, Germany, and France, highlighting their perceived importance in supporting the growth and development of synthetic biology start-ups. Meanwhile, introductions and referrals were another common

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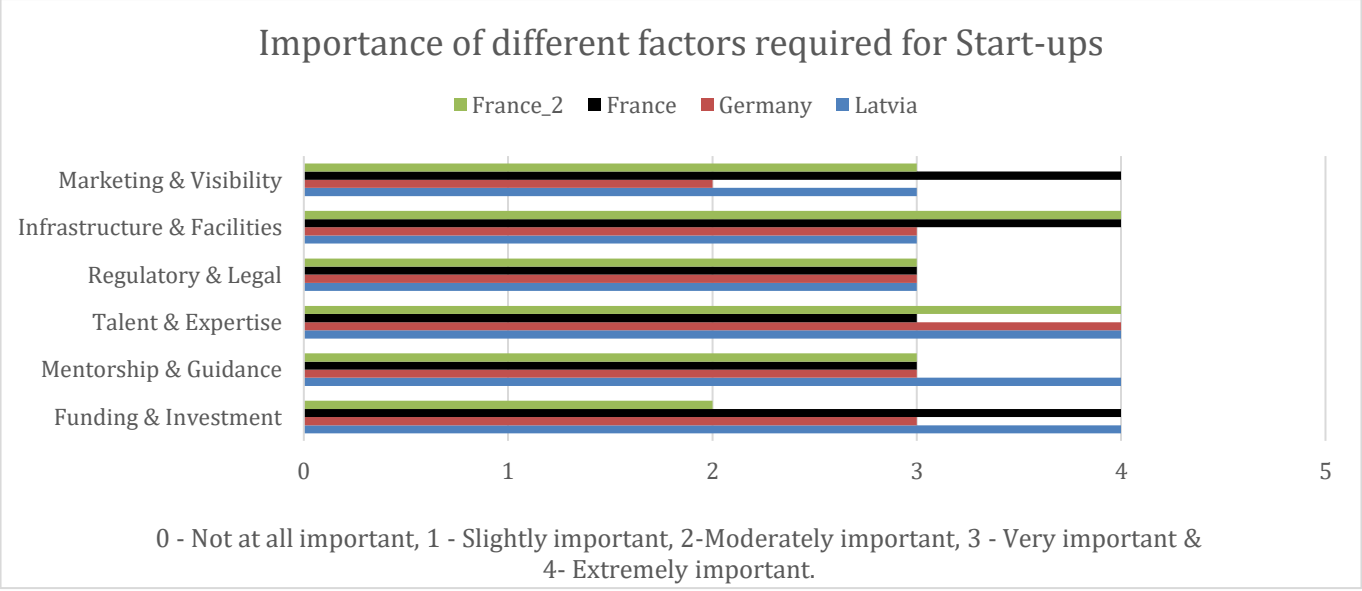
choice, particularly in Germany and Latvia, emphasizing the importance of personal networks and direct connections in these countries' entrepreneurial ecosystems. One respondent highlighted the need for a centralized platform with comprehensive information on all funding opportunities from France. Additionally, there was a suggestion from France for the creation of a dedicated ecosystem involving various stakeholders.

4. *Which of the below support/resources do synthetic biology start-ups need to succeed but are currently lacking in your country? Please rank the below options on the level of importance: 0 - Not at all important, 1 - Slightly important, 2-Moderately important, 3 - Very important & 4- Extremely important.*
   a. Access to funding and investment
   b. Mentorship and guidance from industry experts (IP, scale-up)
   c. Access to talent and expertise
   d. Regulatory and legal support
   e. Access to infrastructure with relevant equipment and facilities.
   f. Marketing for better visibility to investors.
   g. Other (please specify)



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- **Talent & Expertise:** Rated 'Extremely Important' by Latvia and Germany, 'Very Important' by France, and 'Extremely Important' by the second respondent from France.
- **Infrastructure & Facilities:** Rated 'Very Important' by Latvia and Germany, and 'Extremely Important' by both respondents from France.
- **Funding & Investment:** Viewed as 'Extremely Important' by Latvia and France, 'Very Important' by Germany, and 'Moderately Important' by the second respondent from France.
- **Mentorship & Guidance:** Consistently rated as 'Very Important' across all countries.
- **Regulatory & Legal:** Rated 'Very Important' by all respondents.
- **Marketing & Visibility:** Varied ratings with 'Very Important' by Latvia, 'Slightly Important' by Germany, 'Extremely Important' by France, and 'Very Important' by the second respondent from France.

The data shows that 'Talent & Expertise', and 'Infrastructure & Facilities' are perceived as the most crucial needs for synthetic biology start-ups, followed closely by 'Funding & Investment' and 'Mentorship & Guidance'. 'Regulatory & Legal' support and 'Marketing & Visibility' are also important but have slightly lower average importance ratings. These insights indicate a strong need for skilled professionals, adequate infrastructure, financial support, and expert guidance in the field of synthetic biology across the surveyed regions.

5. *In your opinion, how can entrepreneurial skills be enhanced among students conducting synthetic biology academic research in your country?*
   a. Offering entrepreneurship courses such as project management, finance, and marketing.
   b. Start-up idea pitch competitions
   c. Providing mentorship from successful entrepreneurs and networking opportunities.
   d. Encouraging participation in accelerator programs.
   e. Encouraging interdisciplinary collaborations to develop skills in communication, collaboration, and creativity.
   f. Strengthen co-operation between universities and companies.

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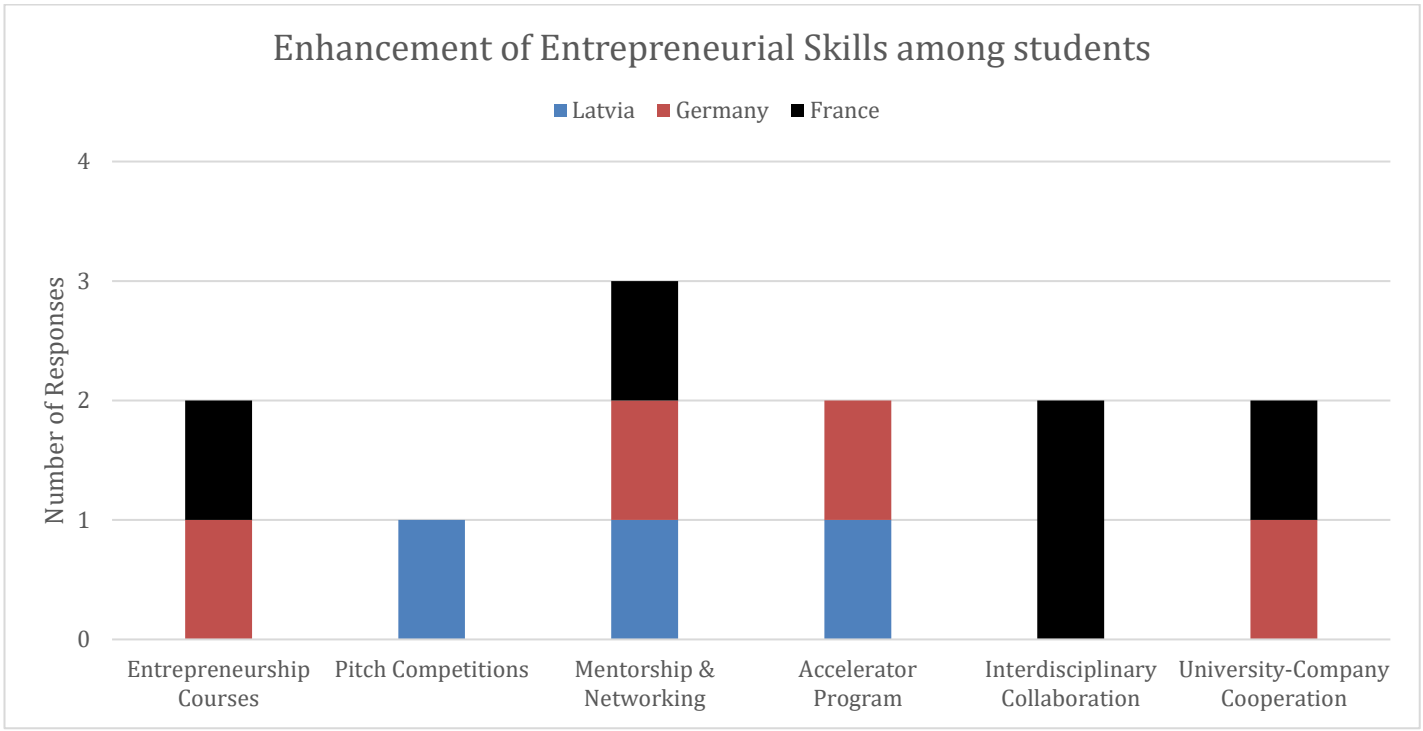

Respondents from Germany and France favoured entrepreneurship courses, indicating a belief in the importance of formal education in project management, finance, and marketing for building entrepreneurial capabilities. Latvian respondents showed support for start-up idea pitch competitions, emphasizing the value of practical experience and a competitive mindset in promoting business acumen.

Mentorship emerged as the most frequently chosen option, with respondents from all three countries recognizing its importance. Both Latvia and Germany highlighted the importance of accelerator programs. French respondents exclusively favoured interdisciplinary collaborations. Germany and France recognized the significance of collaboration between academic institutions and the business sector.

In summary, the survey results indicate diverse preferences for enhancing entrepreneurial skills, with mentorship and real-world experience (through accelerators, competitions, and university-company cooperation) being the most popular choices. Formal coursework was

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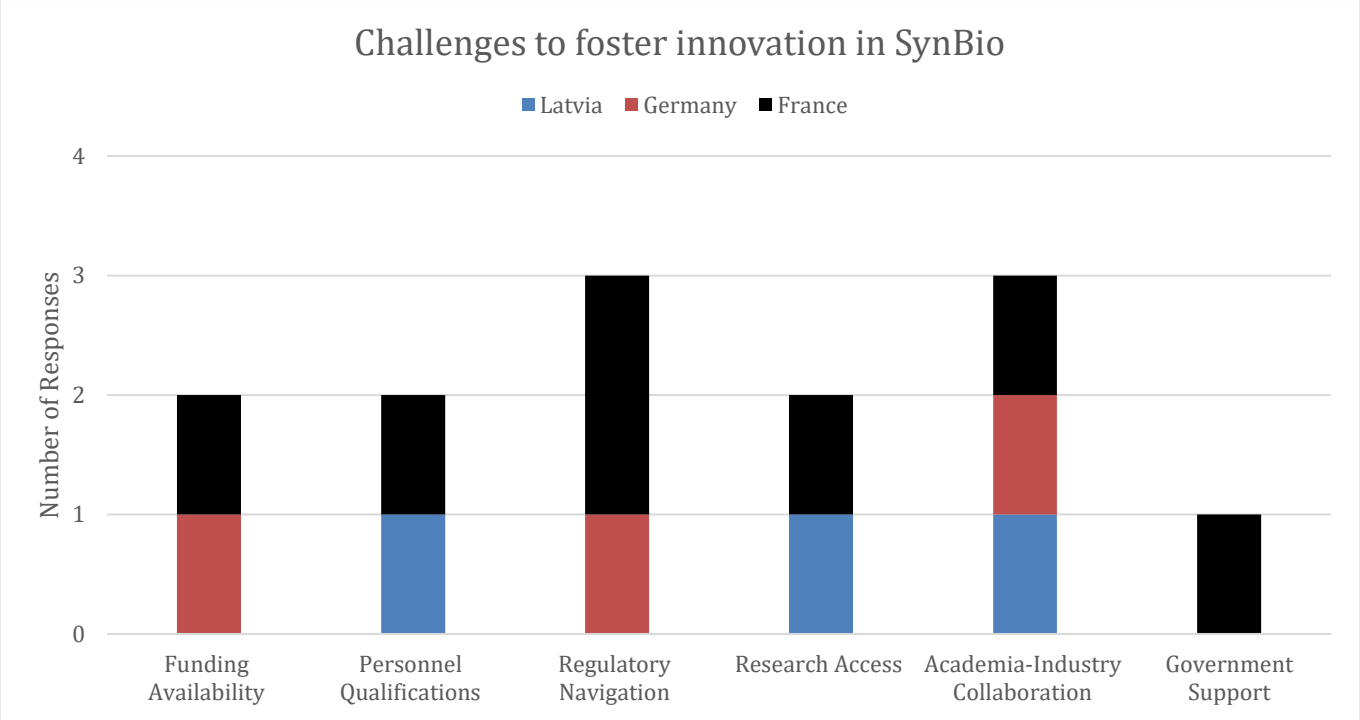
also seen as essential by some, while interdisciplinary collaboration was favoured for developing a broader skill set. These insights can inform the development of tailored programs for student entrepreneurs in the synthetic biology field.

6. *What are some of the challenges faced by your organization to foster innovation in the field of synthetic biology in your country? Please select all that apply:*
   a. Limited availability of funding and investment opportunities
   b. Lack of qualified and experienced personnel
   c. Difficulty in navigating the regulatory landscape.
   d. Limited access to cutting-edge research and technologies
   e. Lack of collaboration between academia and industry
   f. Insufficient support from government or policy makers
   g. Other (please specify)



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In Latvia, the respondent highlighted issues related to the scarcity of qualified and experienced personnel, limited access to cutting-edge research and technologies, and insufficient collaboration between academia and industry. In Germany, the respondent identified challenges concerning the restricted availability of funding and investment opportunities, difficulties in navigating the regulatory landscape, and the need for improved collaboration between academia and industry. France exhibited a more complex landscape, with two respondents mentioning multiple challenges. These encompassed limited funding opportunities, a shortage of qualified personnel, regulatory complexities, restricted access to advanced research and technologies, inadequate collaboration between academia and industry, and insufficient government support.

7. *What specific areas of training or education are essential for individuals to succeed in synthetic biology entrepreneurship, but are not currently sufficiently available (lack) in your country? Select all that apply.*
   a. Thorough understanding of synthetic biology concepts.
   b. Data science and statistics.
   c. Regulatory affairs and compliance requirements relating to biosafety, biosecurity, and environmental protection.
   d. Intellectual property (IP) law with basic understanding of patent law, trademarks, and copyrights.
   e. Fundraising skills such as effective pitch creation and communication.
   f. Team building, project management and leadership skills.
   g. IT Skills, Machine learning, AI
   h. Business plan, business modelling, manufacturing
   i. Other (please specify)

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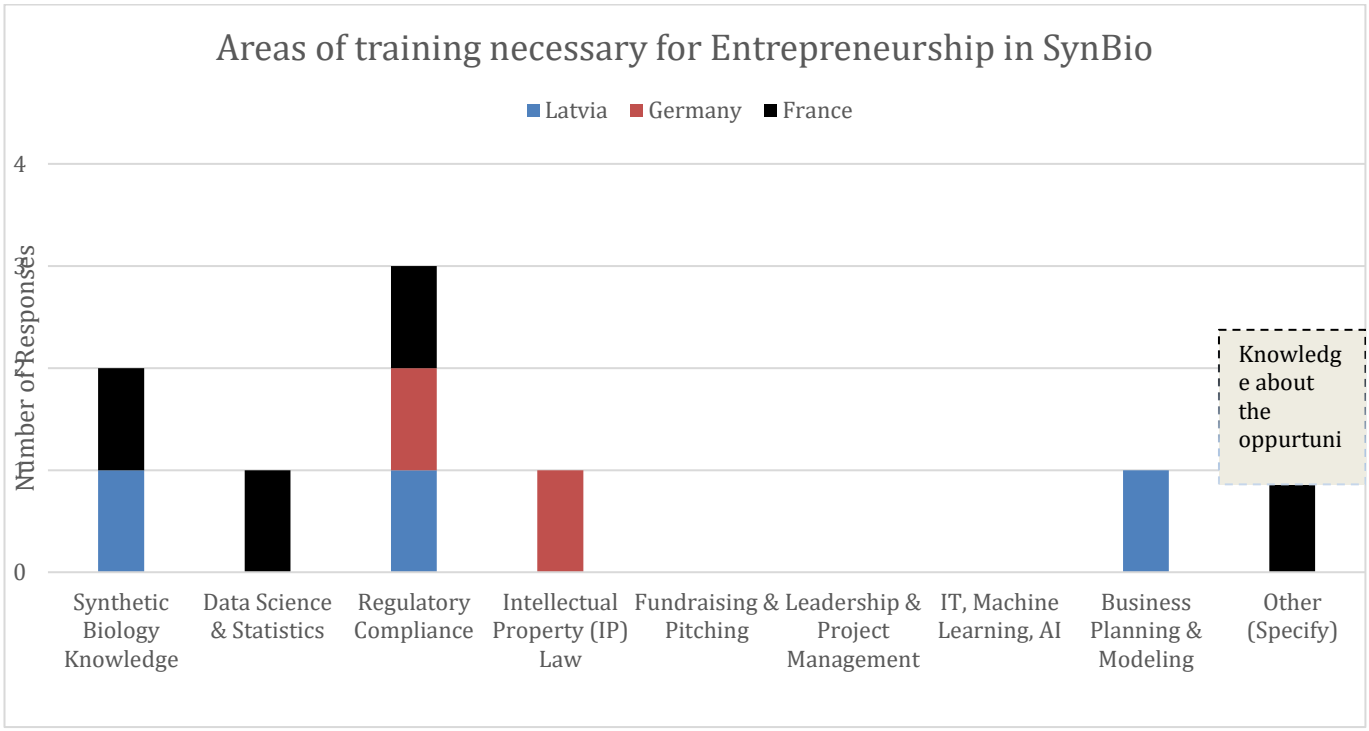

Latvia expressed a need for training in a thorough understanding of synthetic biology concepts, regulatory affairs, and business-related aspects like business planning, modelling, and manufacturing. In contrast, a respondent from Germany identified a gap in intellectual property law knowledge, with a basic understanding of patent law, trademarks, and copyrights. In France, two respondents highlighted various areas, including the need for education in synthetic biology concepts, data science and statistics, regulatory affairs, and emphasized the importance of knowledge about sector opportunities.

8. *How can entrepreneurial skills be enhanced among students conducting synthetic biology academic research in your country?*
   a. Offering entrepreneurship courses such as project management, finance, and marketing.
   b. Start-up idea pitch competitions.
   c. Providing mentorship from successful entrepreneurs and networking opportunities.
   d. Encouraging participation in accelerator programs.

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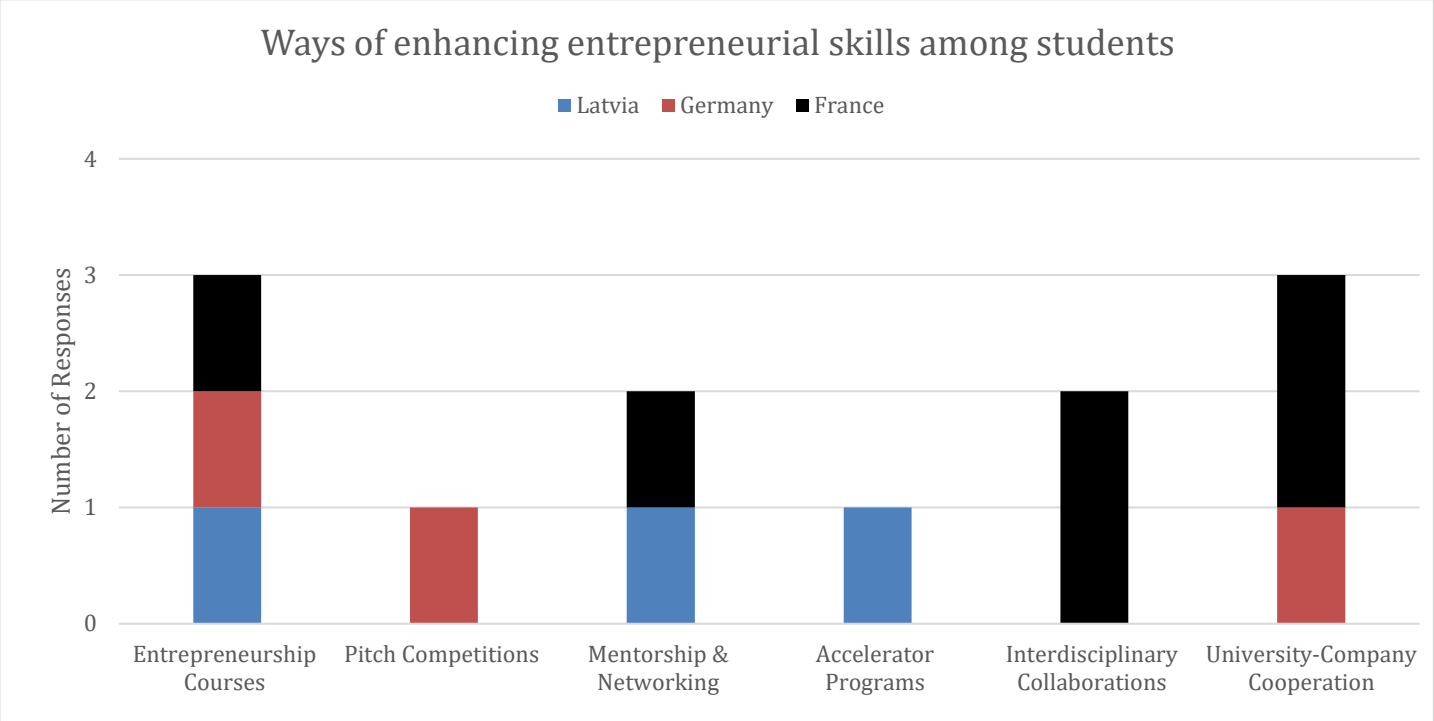
e. Encouraging interdisciplinary collaborations to develop skills in communication, collaboration, and creativity.

f. Strengthen co-operation between universities and companies.



When asked about how to enhance entrepreneurial skills among students conducting synthetic biology academic research in their respective countries, respondents provided a range of strategies. In Latvia, the respondent suggested offering entrepreneurship courses (a), providing mentorship and networking opportunities (c), and encouraging participation in accelerator programs (d). In Germany, the emphasis was on entrepreneurship courses (a), start-up idea pitch competitions (b), and strengthening cooperation between universities and companies (f). French respondents, however, advocated for a more diverse approach, including entrepreneurship courses (a), mentorship and networking (c), interdisciplinary collaborations (e) to develop communication, collaboration, and creativity skills, and university-company cooperation (f). These responses underscore the importance of a multifaceted approach to enhance entrepreneurial skills among students in the field of synthetic biology, incorporating both formal education and practical experiences like competitions and collaborations.

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9. *Which of the below is currently lacking by start-ups to better attract investors in your country? Please select up to 4 most important choices from the options below.*
    a. *Developing clear and concise messaging of their company mission, vision, and purpose.*
    b. *Creating and engaging with informative content on their impact.*
    c. *Leveraging social media and digital marketing to reach wider audiences.*
    d. *Hosting events and presentations on a regular basis to attract investors.*
    e. *Preliminary data convincing feasibility to potential investors.*
    f. *A strong team with key expertise.*
    g. *Smooth negotiation with the Technology Transfer Office (TTO).*
    h. *Sufficient knowledge of the investors' portfolio including investment criteria, diversification strategy and risk management approach.*
    i. *None of the above.*
    j. *Other (please specify)*

When asked about the key factors currently lacking among start-ups to attract investors in their respective countries, respondents provided valuable insights. In Latvia, the respondent emphasized the importance of creating engaging content on impact, presenting preliminary data for feasibility, and having a strong team with key expertise. Meanwhile, the German respondent identified the significance of hosting regular events and presentations to attract investors, presenting preliminary data, having a strong team, and possessing sufficient knowledge of investors' portfolios, including investment criteria and risk management approaches.

In France, two respondents echoed the importance of creating engaging content on impact and having a strong team with key expertise. Additionally, they emphasized the importance of smooth negotiations with the Technology Transfer Office (TTO) and gaining a good understanding of the competitive landscape. The respondents also mentioned other specific factors related to access to infrastructure and competitive landscape knowledge. These insights reflect a variety of elements that start-ups should consider to better attract investors in their respective countries.

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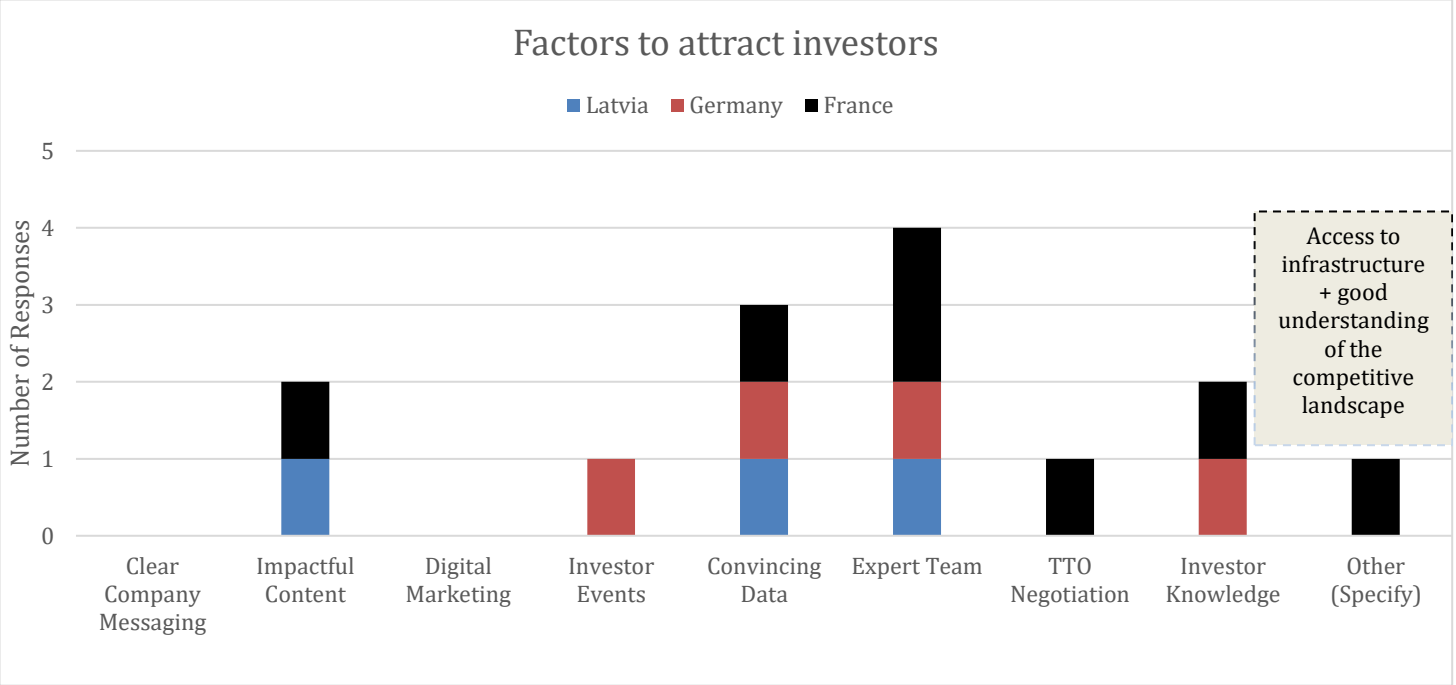

10. *In your experience, during which stage does an entrepreneur require the most assistance to successfully establish their own company? Please select all that apply.*
    a. *Idea generation*
    b. *Funding*
    c. *Business planning*
    d. *Marketing*
    e. *Development and Launch*
    f. *Validation*
    g. *Growth/Scale-up*
    h. *Identifying market demand for the technology*

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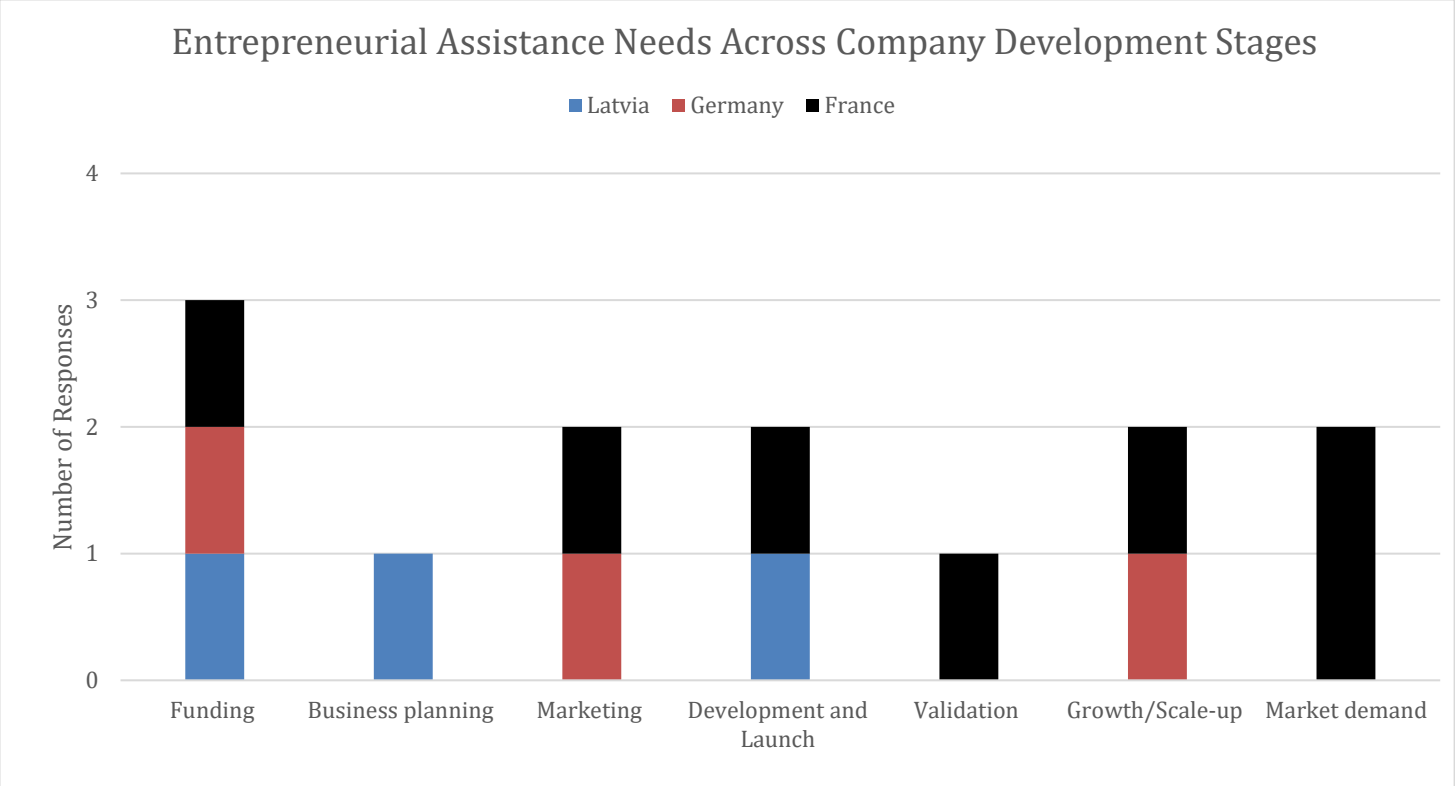

When assessing the stages at which entrepreneurs require the most assistance to establish their own companies, the responses from respondents in Latvia, Germany, and France shed light on common areas of need. Funding (b) emerged as a consistent concern, with all respondents recognizing its importance. Additionally, business planning (c), marketing (d), and development and launch (e) were identified as critical stages, signifying the multifaceted challenges faced by entrepreneurs during these phases.

The responses also highlighted later-stage needs, with development and validation (f) as well as growth and scale-up (g) garnering attention from multiple respondents, suggesting that ongoing support is crucial as companies evolve. Identifying market demand for the technology (h) was cited by respondents from France, indicating the significance of market analysis throughout a company's journey. Overall, the responses underscore the dynamic nature of entrepreneurship, where diverse forms of assistance are required at various stages of a company's development.

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11. *What facilities and equipment are available for synthetic biology research at your institution? Select all that apply:*
    a. There are new or renovated lab facilities equipped with specialized synthetic biology equipment available for use.
    b. My institution has collaborations with industry for access to cutting-edge equipment and technology.
    c. My institution has applied or obtained grants to purchase new equipment specifically for Synthetic Biology research. If possible, please specify the funding agencies you have applied or obtained grant from:
    _____
    d. We have access to shared facilities available for interdisciplinary research across departments or institutions, including those that may be used for synthetic biology.
    e. We have partnerships with other institutions for resource and expertise sharing.
    f. We have access to a bio foundry.
    g. We have very limited access to the state-of-the-art laboratory facilities and only basic equipment is available to use.
    h. Other (please specify)

In Latvia, the response indicated very limited access to state-of-the-art laboratory facilities, with only basic equipment accessible. In Germany, there is access to newly renovated lab facilities equipped with specialized synthetic biology equipment, collaborations with industry for cutting-edge equipment and technology, and grants have been applied for or obtained specifically for synthetic biology research equipment.

Meanwhile, in France, respondents reported access to newly renovated lab facilities with specialized equipment, collaborations with industry for advanced equipment, grants for synthetic biology research equipment, access to shared interdisciplinary research facilities, partnerships with other institutions for resource and expertise sharing. The responses highlight variations in research infrastructure across these countries.

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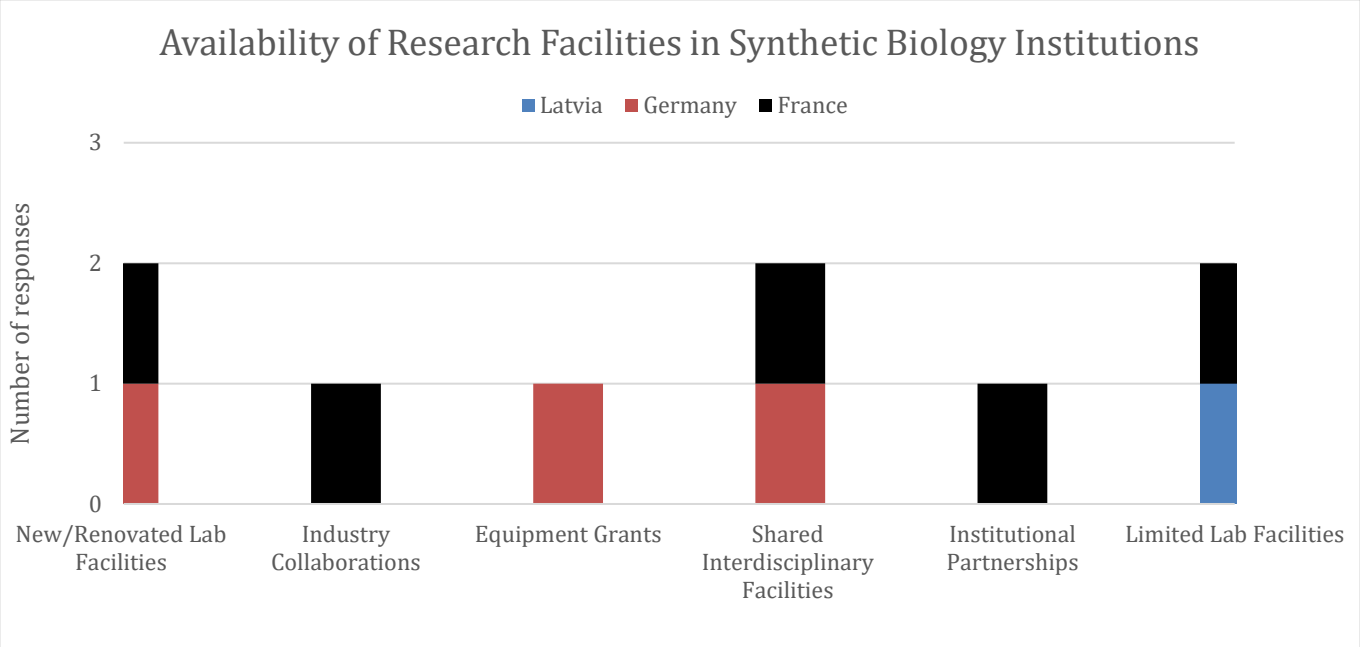

12. *Does your organisation often interact with local, national, international academic community?*
    a. Yes, we host students for (short/long) internships.
    b. Yes, we have visiting researchers for synthetic biology-related research projects.
    c. Yes, we invite scientific experts as Executive or Scientific Advisory Board members.
    d. No interactions but would be interested to host students.
    e. No but would be interested to have visiting researchers.
    f. No but would be happy to identify and invite relevant experts for the board(s).
    g. Other (Please specify).

In response to the question about interactions with the academic community, the following responses were received: Latvia: One respondent indicated interest in hosting visiting researchers (e) and identifying and inviting relevant experts for advisory boards (f). Germany: One respondent reported hosting students for internships (a), having visiting researchers for synthetic biology-related research projects (b), and inviting scientific experts as Executive or Scientific Advisory Board members (c). France: Two respondents mentioned hosting students for internships (a), inviting scientific experts as board members (c), and providing additional information in the "Other" category. One of the French respondents noted organizing contests and managing access to EU support programs via EIT FOOD (g).

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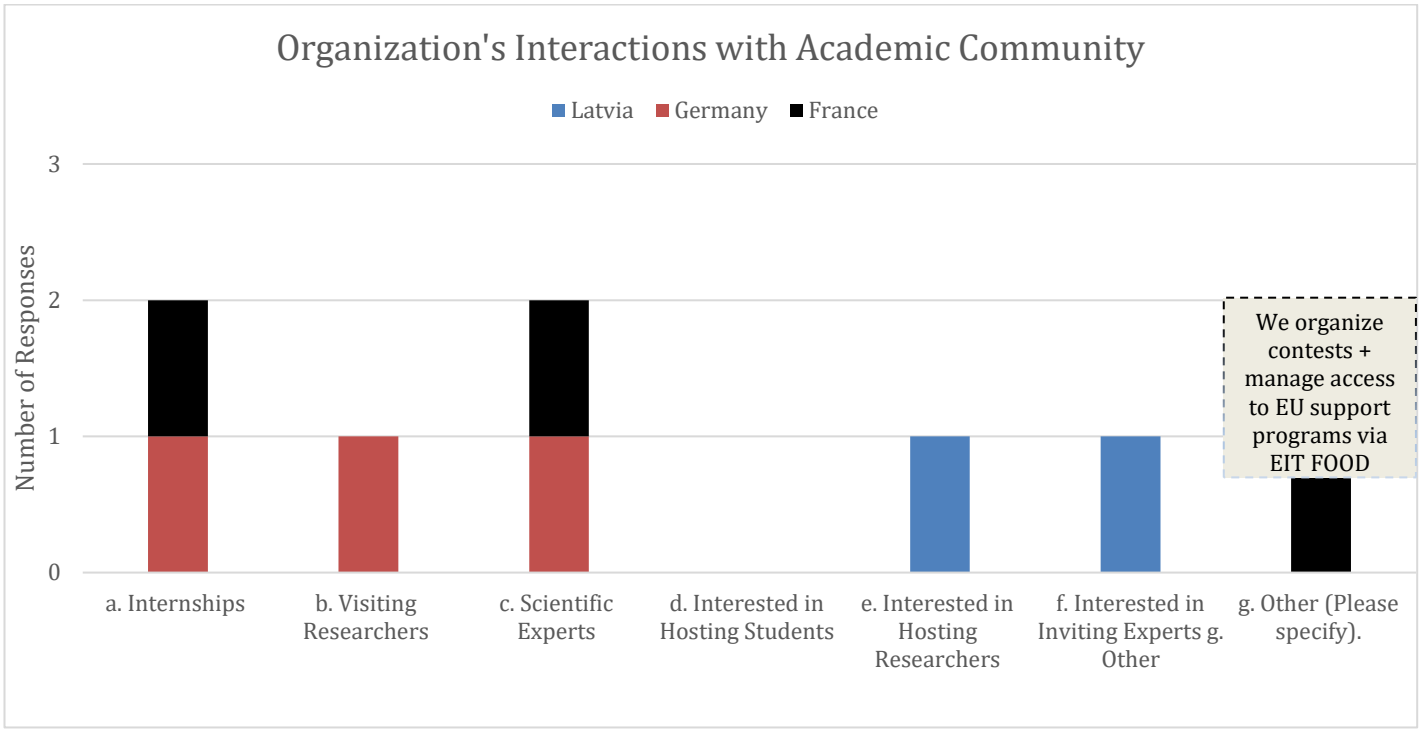

13. *Please rate the importance of below options for enhancing students' employability in synthetic biology, which might be currently lacking in your country.*

    0-Not at all important, 1 – Slightly Important, 2 – Moderately Important, 3 – Very Important, 4 – Extremely Important.

    a. Introducing more practical training programs such as field work and wet-lab experience.
    b. Including industry professionals for mentorship and guidance in curriculum design.
    c. Encouraging student participation in industrial internships.
    d. Offering more job placement services.
    e. Offering more transversal skills such as IP training, management skills, financial planning, and forecasting.
    f. Other (Please specify)
    Comments

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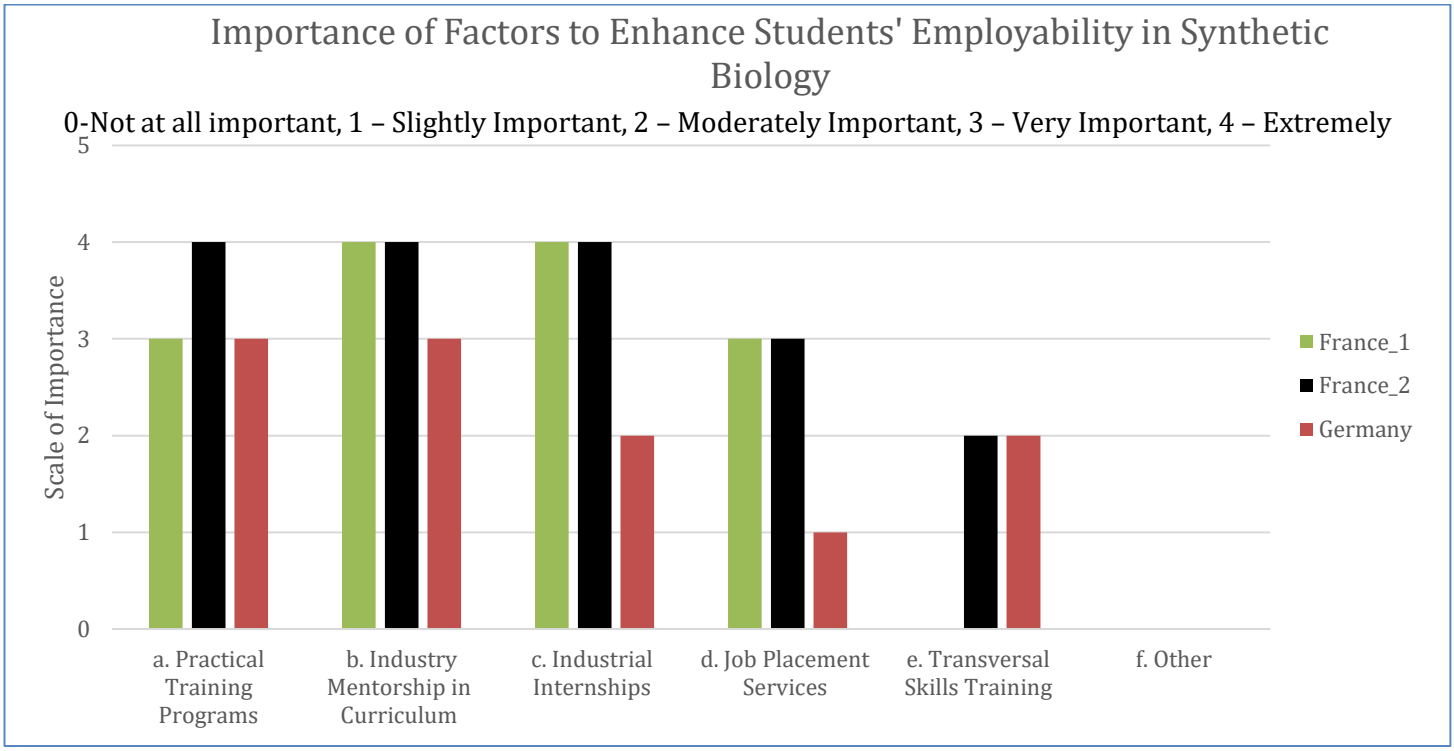

14. *What do you think are the most significant obstacles that deter investors from investing in synthetic biology start-ups in your country? Select all that apply.*
    - *a. Regulatory compliance issues*
    - *b. Intellectual property concerns*
    - *c. financial risks*
    - *d. technical feasibility*
    - *e. Lack of industry experience in the team*
    - *f. public perception*
    - *g. Market competition*
    - *h. Commercialization challenges*
    - *i. long development time*
    - *j. Lack of understanding of investment process in deep tech/synbio startups*
    - *k. Others (Please specify)*

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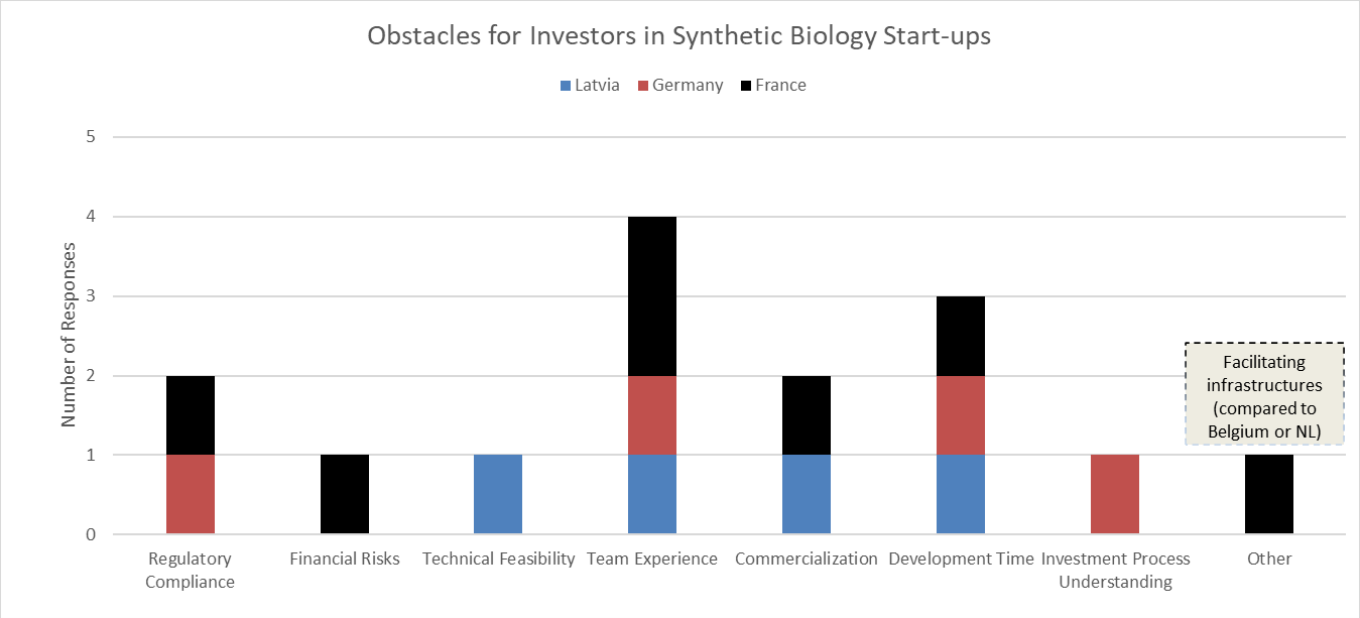

In response to the question about the most significant obstacles deterring investors from investing in synthetic biology start-ups, the following responses were received:

Latvia: One respondent identified technical feasibility (d), lack of industry experience in the team (e), commercialization challenges (h), long development time (i), and lack of understanding of the investment process in deep tech/synbio startups (j) as significant obstacles. Germany: One respondent cited lack of industry experience in the team (e), long development time (i), and lack of understanding of the investment process in deep tech/synbio startups (j) as the main obstacles. France: Two respondents indicated regulatory compliance issues (a), financial risks (c), lack of industry experience in the team (e), commercialization challenges (h), long development time (i), and specified additional obstacles in the "Other" category. One of the French respondents mentioned facilitating infrastructures in comparison to Belgium or the Netherlands (k).

15. *Which of the following types of private funding are currently most active in your country to support synthetic biology research and development? Please select all that apply.*
    a. Business angels
    b. Venture capital (VC)

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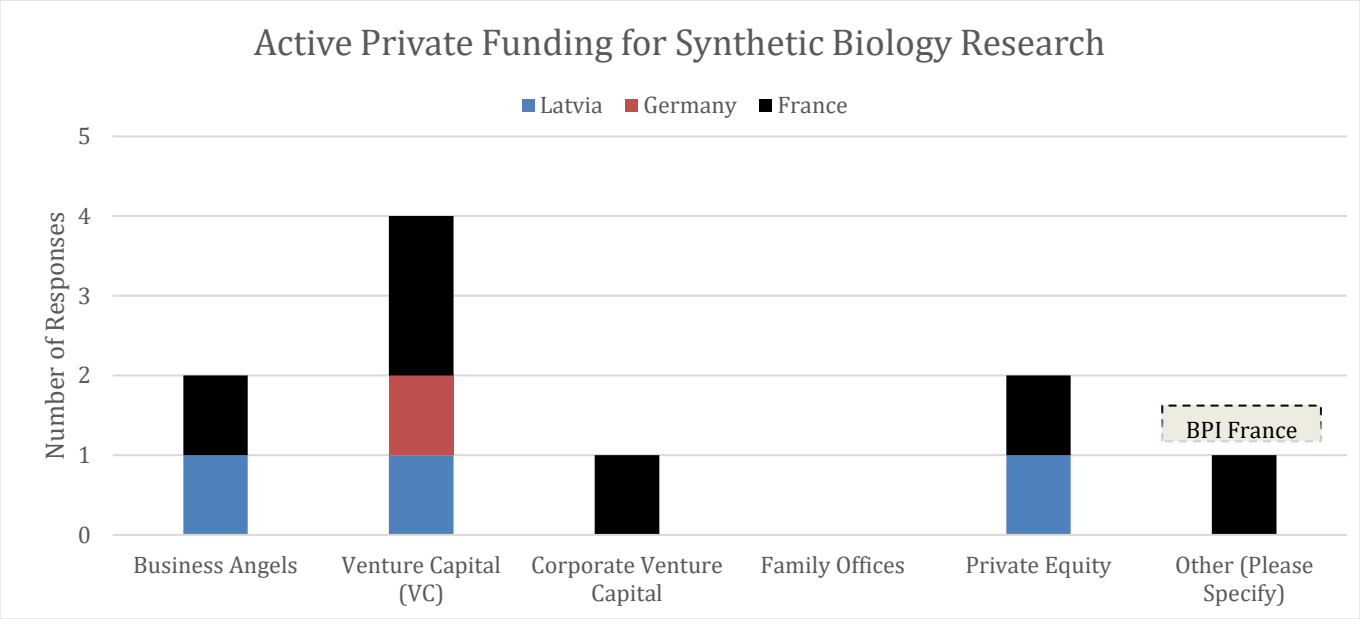
c. corporate venture capital (CVC)
d. Family offices
e. Private equity
f. Other (please specify)



Here are the types of private funding that are currently most active in the respective countries for supporting synthetic biology research and development based on the responses:

Latvia: Business angels (a), Venture capital (VC) (b), Private equity (e). Germany: Venture capital (VC) (b). France: Business angels (a), Venture capital (VC) (b), Corporate venture capital (CVC) (c), Private equity (e), and specified "BPI France" as another source of funding (f).

16. *What other sources of funding for synthetic biology research are available in your country?*
    a. National funding agencies, please specify:
    _____

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b. European Union funding, please specify:

_____

c. Private foundations, please specify:

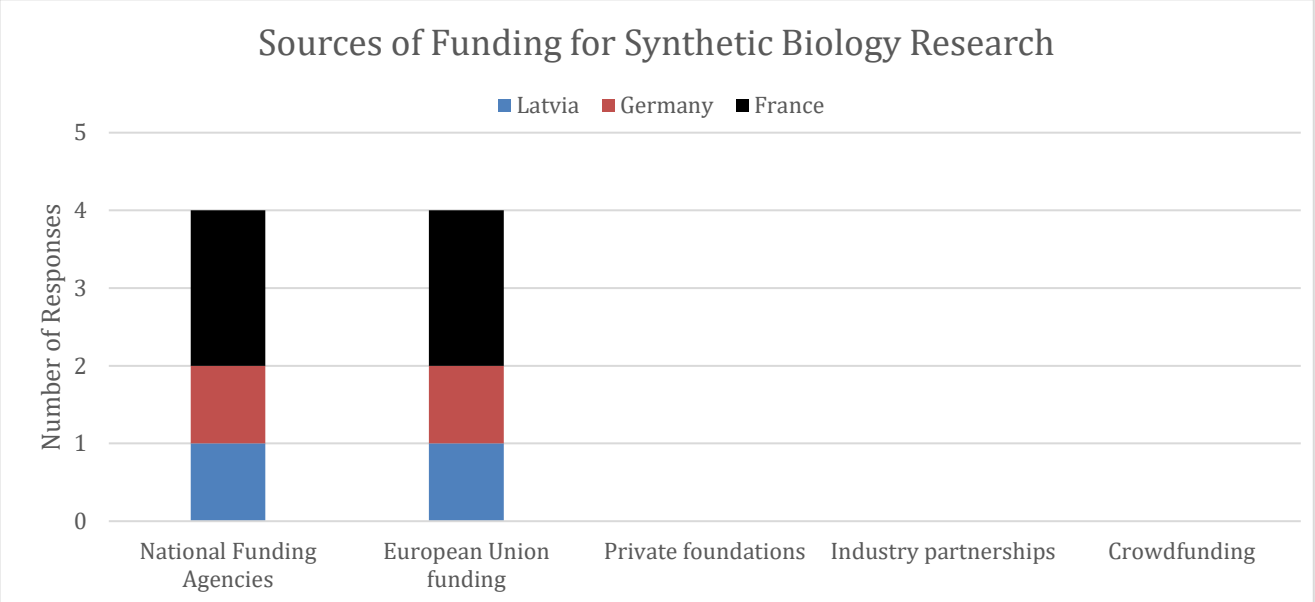
_____

d. Industry partnerships where companies provide funding and expertise in exchange for access to the resulting technologies. Please specify:

_____

e. Crowdfunding please specify:

_____



In response to the question about other sources of funding for synthetic biology research in their respective countries, the following responses were received:

Latvia: One respondent mentioned national funding agencies, specifically LiAA (a), and European Union funding through Altum (b). Germany: One respondent cited national funding agencies, specifically DFG (Deutsche Forschungsgemeinschaft) (a), and European Union funding through ERC (European Research Council) (b). France: Two respondents identified national funding agencies, including ANR (Agence Nationale de la Recherche) and BPI France

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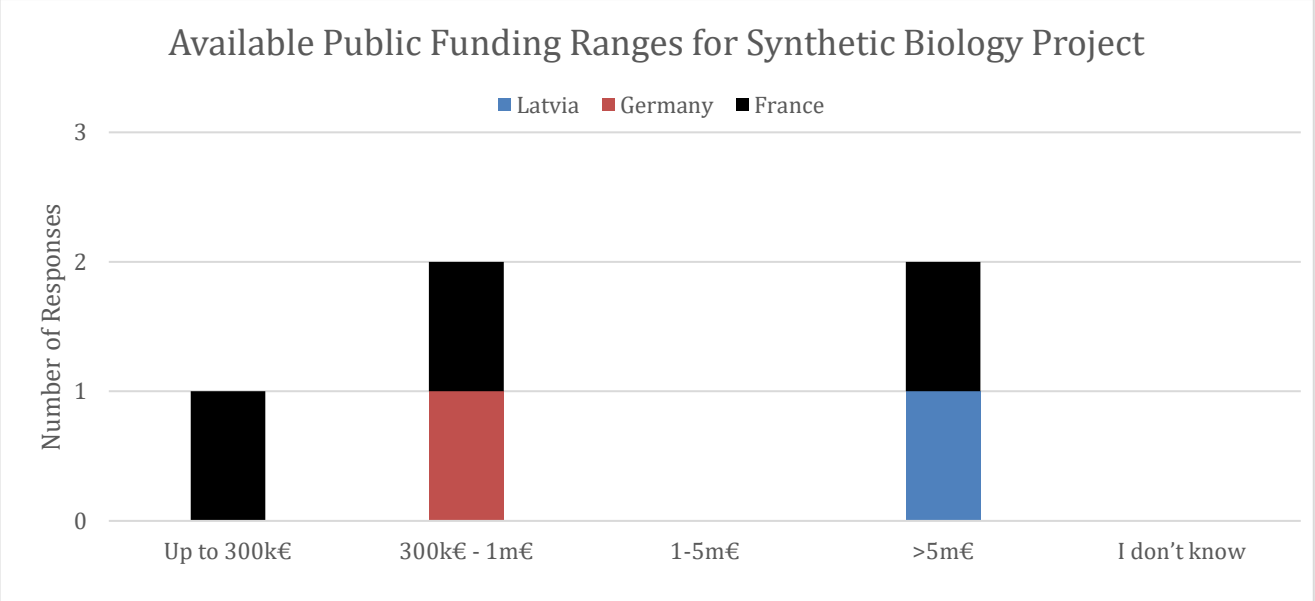
(a), as well as European Union funding sources, such as HORIZON, EIT (European Institute of Innovation & Technology), and EIC (European Innovation Council) (b).

It's worth noting that the other options (c, d, e) were not selected in these responses, suggesting that they may not be as popular or commonly utilized as the mentioned sources of funding in the field of synthetic biology research. These options may not fit into the conventional methods of acquiring funding for this specific research area.

17. *Please select the range of available public funding for synthetic biology projects in your country or generalist funding that can be used for synthetic biology projects:*
    a. Up to 300k€
    b. 300k€ - 1m€
    c. 1-5m€
    d. >5m€
    e. I don't know.



Latvia: One respondent indicated that the available funding falls into the range of >5 million euros (d). Germany: One respondent specified that the funding range is between 300,000 euros and 1 million euros (b). France: Two respondents provided varying ranges of available

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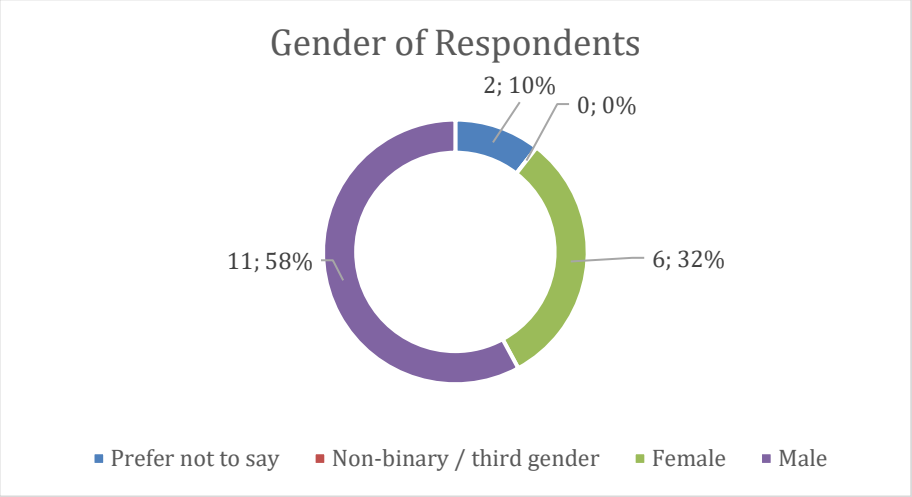
funding. One mentioned up to 300,000 euros (a) and between 300,000 euros and 1 million euros (b), while the other indicated funding exceeding 5 million euros (d). These responses indicate diverse levels of public funding availability for synthetic biology projects or generalist funding that can be utilized for such projects in the respective countries.

6.1.1.4 STAKEHOLDER GROUP: BIG INDUSTRY, SMES, START-UP

- **Demographics**

1. *Gender of Respondents*



2. *Countries of Respondents*

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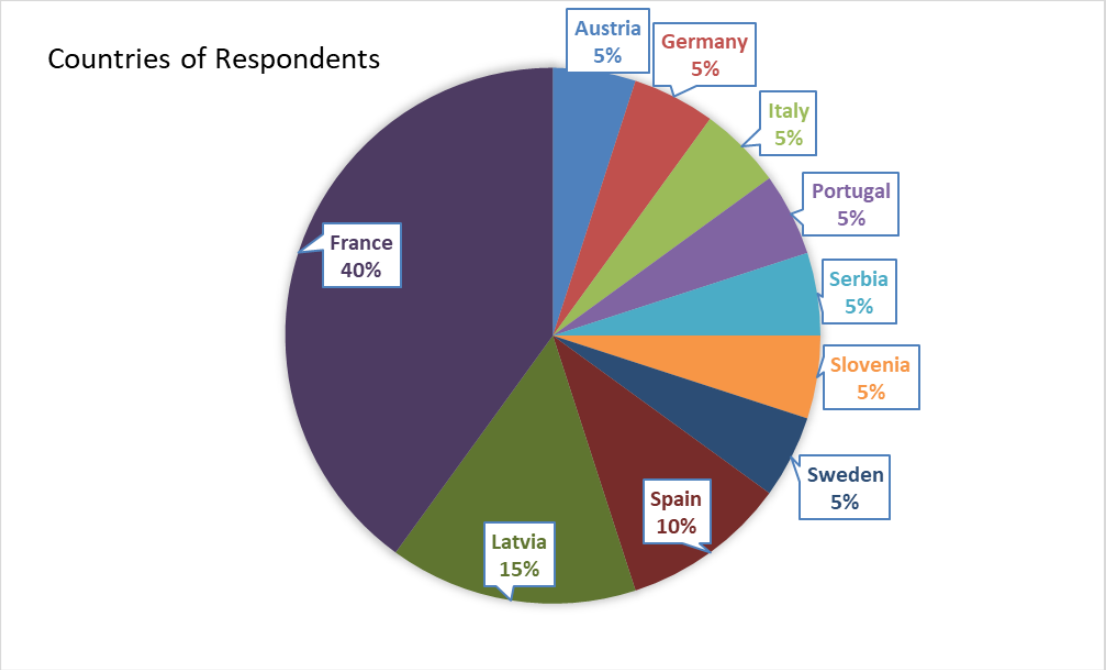

Country	Count	%
Austria	1	5.00%
Germany	1	5.00%
Italy	1	5.00%
Portugal	1	5.00%
Serbia	1	5.00%
Slovenia	1	5.00%
Sweden	1	5.00%
Spain	2	10.00%
Latvia	3	15.00%
France	8	40.00%
Total	**20**	**100.00%**

3. Name of the workplace

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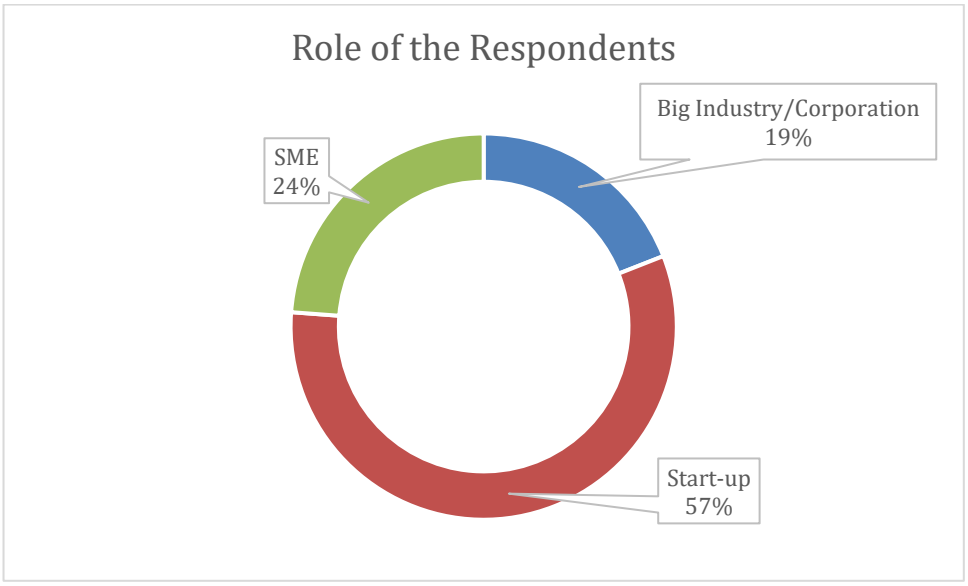
4. *Role of the respondents*



5. *Responses are from the below countries representing the innovation eco-systems.*

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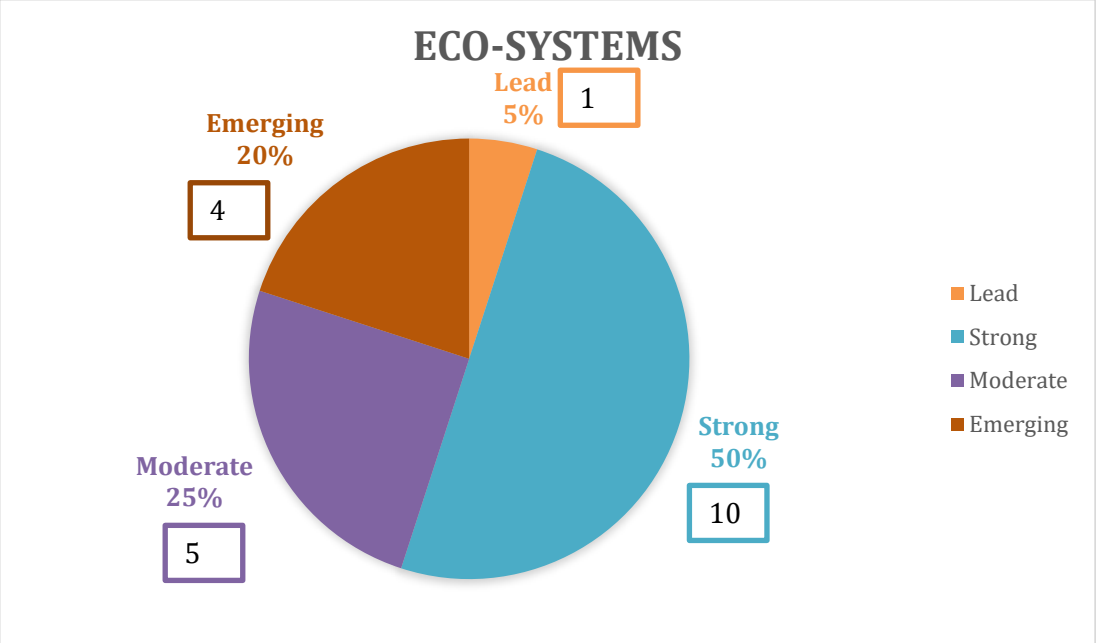

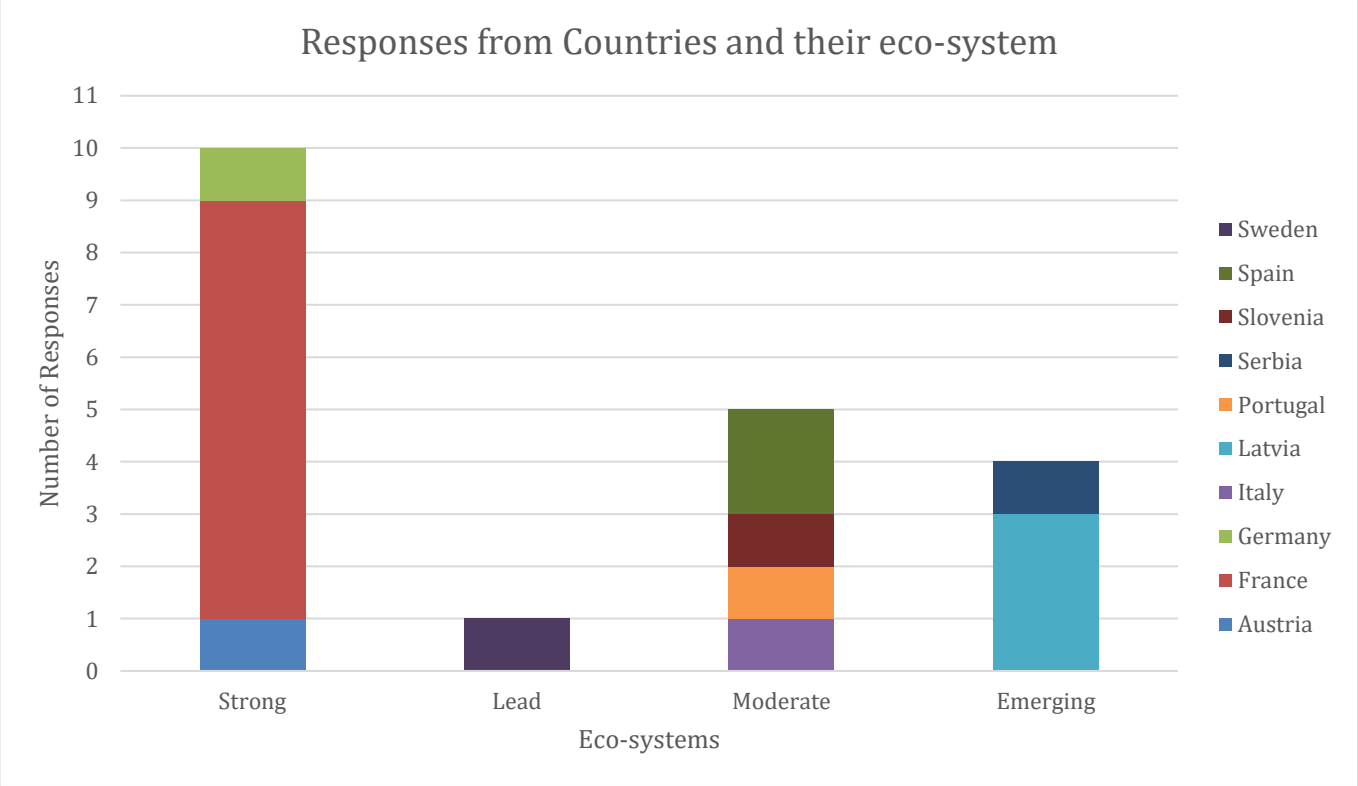

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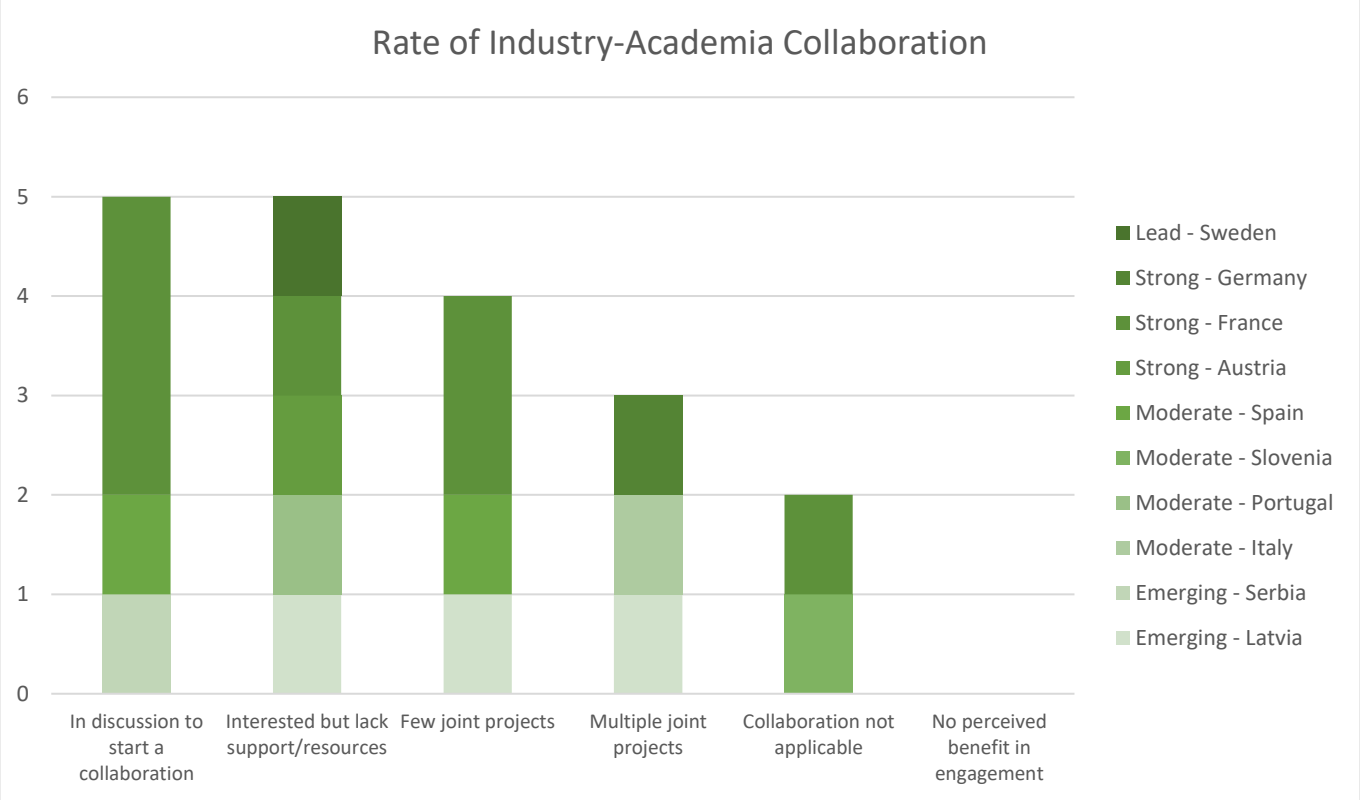
Questions

1. *How would you rate your level of collaboration with academia involving synthetic biology projects? Please choose the most relevant option:*
   a. Multiple joint projects
   b. Few joint projects
   c. In discussion to start a collaboration.
   d. Interested but lack support/resources.
   e. Collaboration not applicable
   f. No perceived benefit in engagement
   g. Other (please specify):



- **Emerging Ecosystem (Latvia and Serbia)**: Exhibited initial discussions to start collaborations and interest but lacked support/resources.
- **Moderate Ecosystem (Italy and Portugal)**: Showed a few joint projects and some in discussion stages.

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- **Strong Ecosystem (Austria, France, Germany)**: Varied responses with France and Germany showing more active collaborations and Austria indicating interest but lacking resources.
- **Lead Ecosystem (Sweden)**: Indicated discussions to start collaboration.

2. *What facilities and equipment are available for synthetic biology research at your institution? Select all that apply:*
   a. There are new or renovated lab facilities equipped with specialized synthetic biology equipment available for use.
   b. My institution has collaborations with industry for access to cutting-edge equipment and technology.
   c. My institution has applied or obtained grants to purchase new equipment specifically for synthetic biology research. Please specify the funding agencies you have applied or obtained grant from:
   d. We have access to shared facilities available for interdisciplinary research across departments or institutions, including those that may be used for synthetic biology research.
   e. We have partnerships with other institutions for resource and expertise sharing.
   f. We have access to a bio foundry.
   g. We have very limited access to the state-of-the-art laboratory facilities and only basic equipment is available to use.
   h. Other (please specify)

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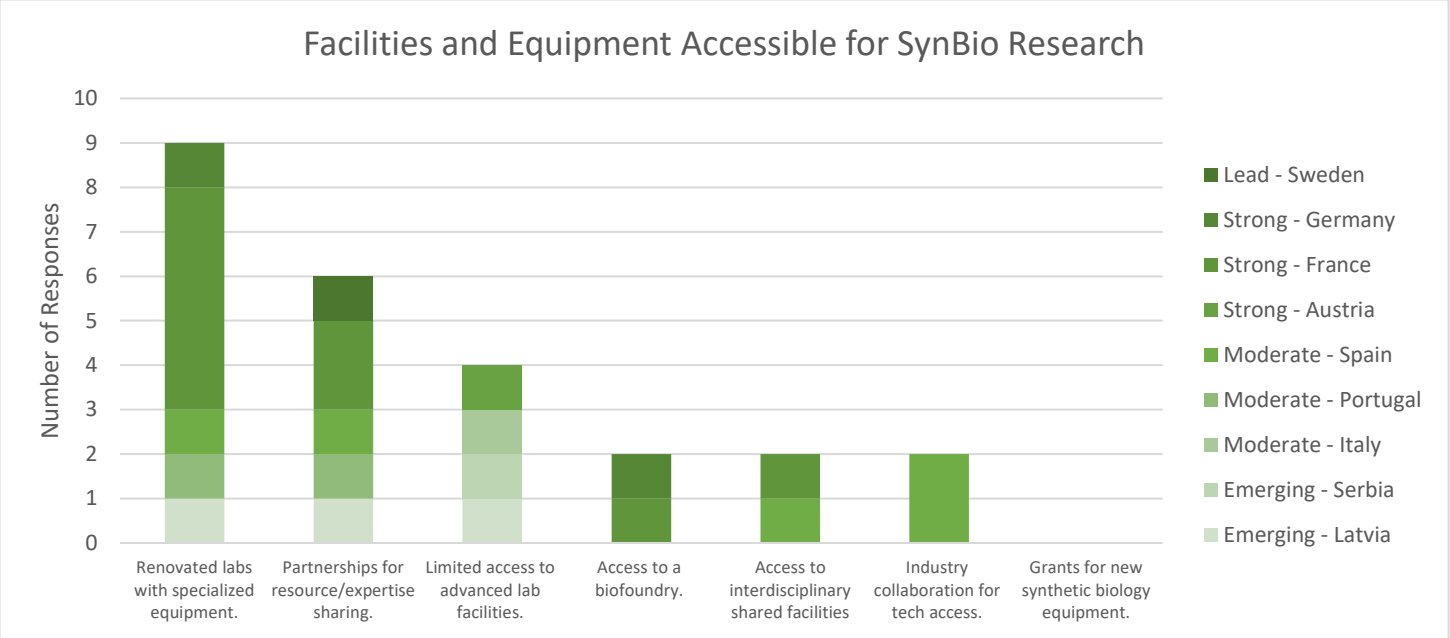

- **Emerging Ecosystem**: Reported renovated labs with specialized equipment and partnerships for resource/expertise sharing.
- **Moderate Ecosystem**: Highlighted limited access to advanced lab facilities and industry collaboration for tech access.
- **Strong Ecosystem**: Demonstrated a range of facilities, including renovated labs, partnerships, and industry collaborations.
- **Lead Ecosystem**: Like Strong, with access to a bio foundry and interdisciplinary shared facilities.

3. *Does your company often interact with local, national, international academic community?*
   a. *Yes, we host students for (short/long) internships.*
   b. *Yes, we have visiting researchers for synthetic biology-related research projects.*
   c. *Yes, we invite scientific experts as Executive or Scientific Advisory Board members.*
   d. *No interactions but would be interested to host students.*
   e. *No but would be interested to have visiting researchers.*
   f. *No but would be happy to identify and invite relevant experts for the board(s).*
   g. *Other (Please specify).*

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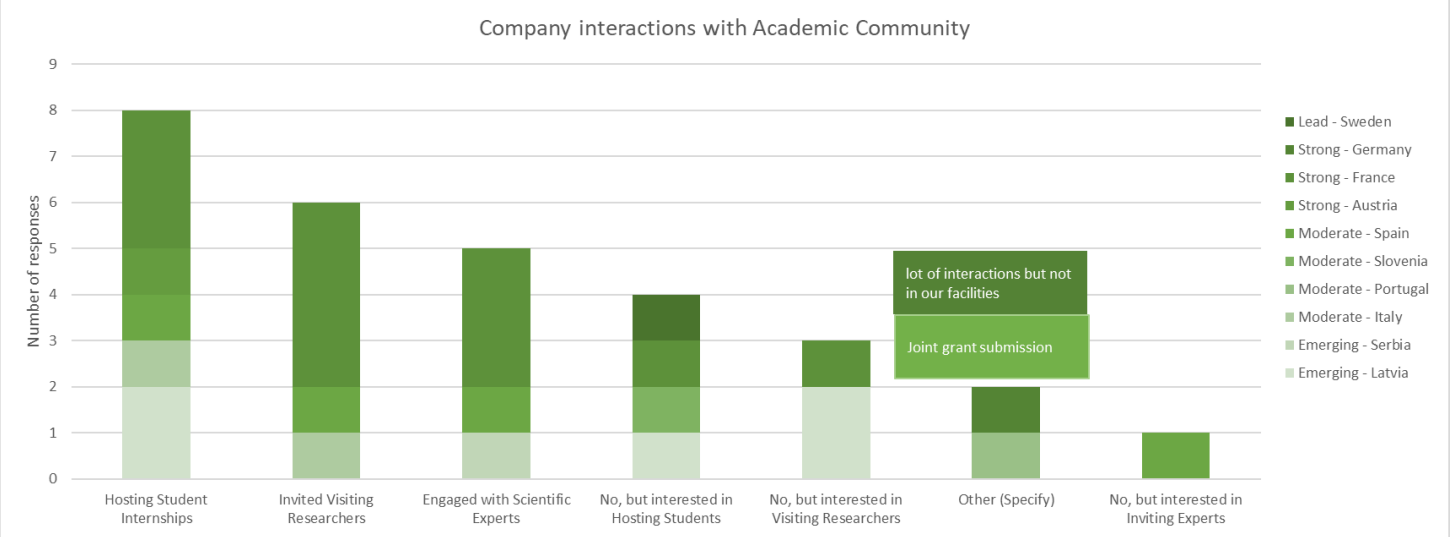

- **Emerging Ecosystem (Latvia and Serbia)**: Focused on hosting student internships and engaging with scientific experts.
- **Moderate Ecosystem (Italy and Portugal)**: Showed a mix of internships, visiting researchers, and engagement with experts.
- **Strong Ecosystem (Austria, France, Germany)**: Varied responses with emphasis on hosting student internships and inviting visiting researchers.
- **Lead Ecosystem (Sweden)**: Demonstrated a strong focus on hosting student internships.

4. *In your opinion, how can entrepreneurial skills be enhanced among students conducting synthetic biology academic research in your country?*
   a. *Offering entrepreneurship courses such as project management, finance, and marketing.*
   b. *Start-up idea pitch competitions.*
   c. *Providing mentorship from successful entrepreneurs and networking opportunities.*
   d. *Encouraging participation in accelerator programs*
   e. *Encouraging interdisciplinary collaborations to develop skills in communication, collaboration, and creativity.*
   f. *Strengthen co-operation between universities and companies.*

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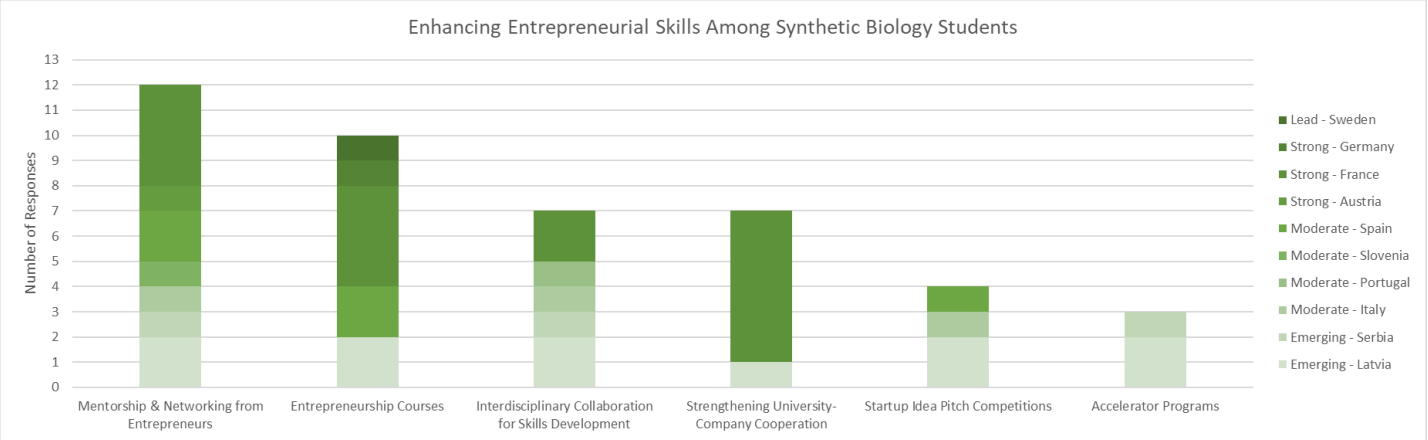

- **Emerging Ecosystem**: Highlighted mentorship and networking from entrepreneurs and entrepreneurship courses.
- **Moderate Ecosystem**: Showed a focus on interdisciplinary collaboration for skills development and university-company cooperation.
- **Strong Ecosystem**: Emphasized the importance of mentorship and entrepreneurship courses.
- **Lead Ecosystem**: Like Strong, with a slight preference for interdisciplinary collaborations.

5. *What specific areas of training or education are essential for individuals to succeed in synthetic biology entrepreneurship, but are not currently sufficiently available (lack) in your country? Select all that apply.*

a. *Thorough understanding of synthetic biology concepts.*
b. *Data science and statistics.*
c. *Regulatory affairs and compliance requirements relating to biosafety, biosecurity, and environmental protection.*
d. *Intellectual property (IP) law with basic understanding of patent law, trademarks, and copyrights.*
e. *Fundraising*
f. *Team building, project management and leadership skills.*
g. *IT Skills, Machine learning, AI*
h. *Business plan, business modelling, manufacturing*
i. *Other (please specify).*

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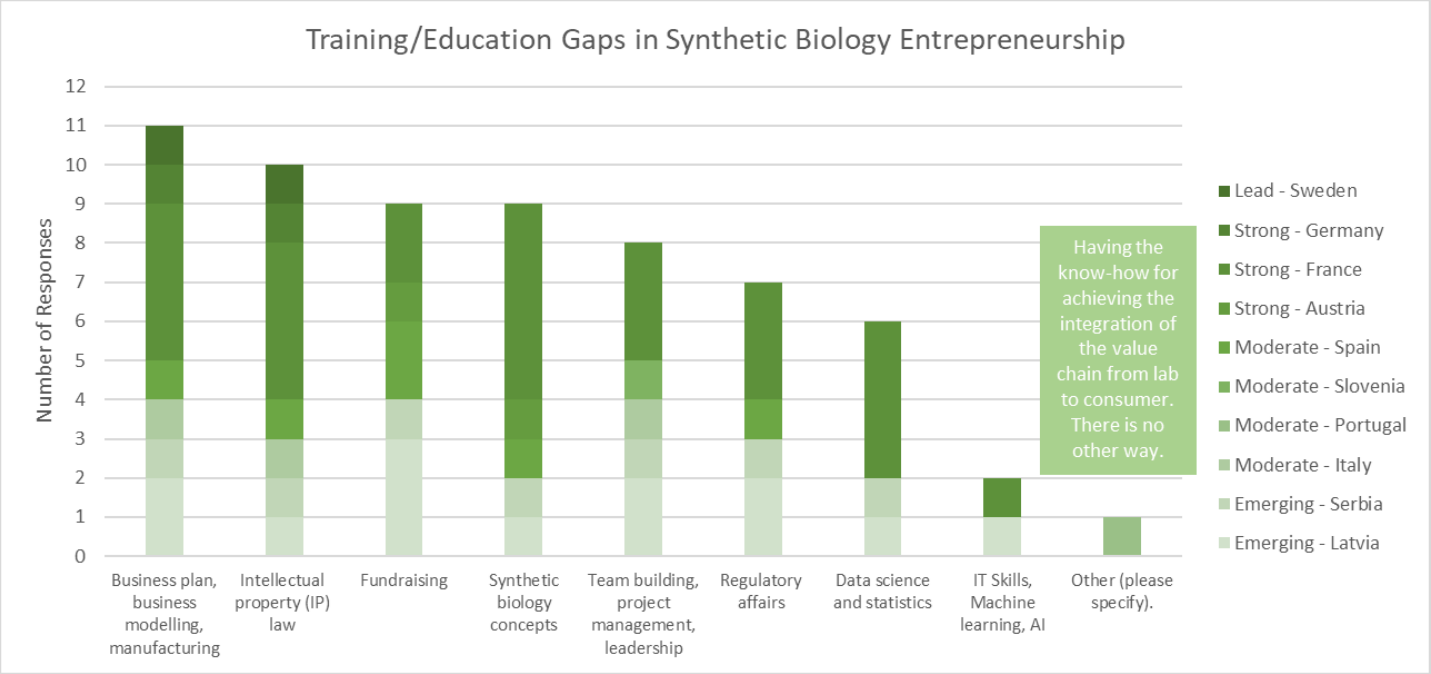

- **Emerging Ecosystem**: Identified business plan, business modelling, manufacturing, and IP law as key areas lacking.
- **Moderate Ecosystem**: Focused on fundraising, synthetic biology concepts, and regulatory affairs.
- **Strong Ecosystem**: Highlighted business plans and IP law as significant lacking areas.
- **Lead Ecosystem**: Similar focus on business plans and fundraising.

6. *Do you frequently need to seek expertise from foreign countries for synthetic biology projects due to a scarcity of local talent?*

a. *Yes, frequently (Please specify where)*
b. *Yes, occasionally.*
c. *No, we have sufficient local talent.*
d. *Not applicable, we do not have synthetic biology projects.*
e. *Other (Please specify)*

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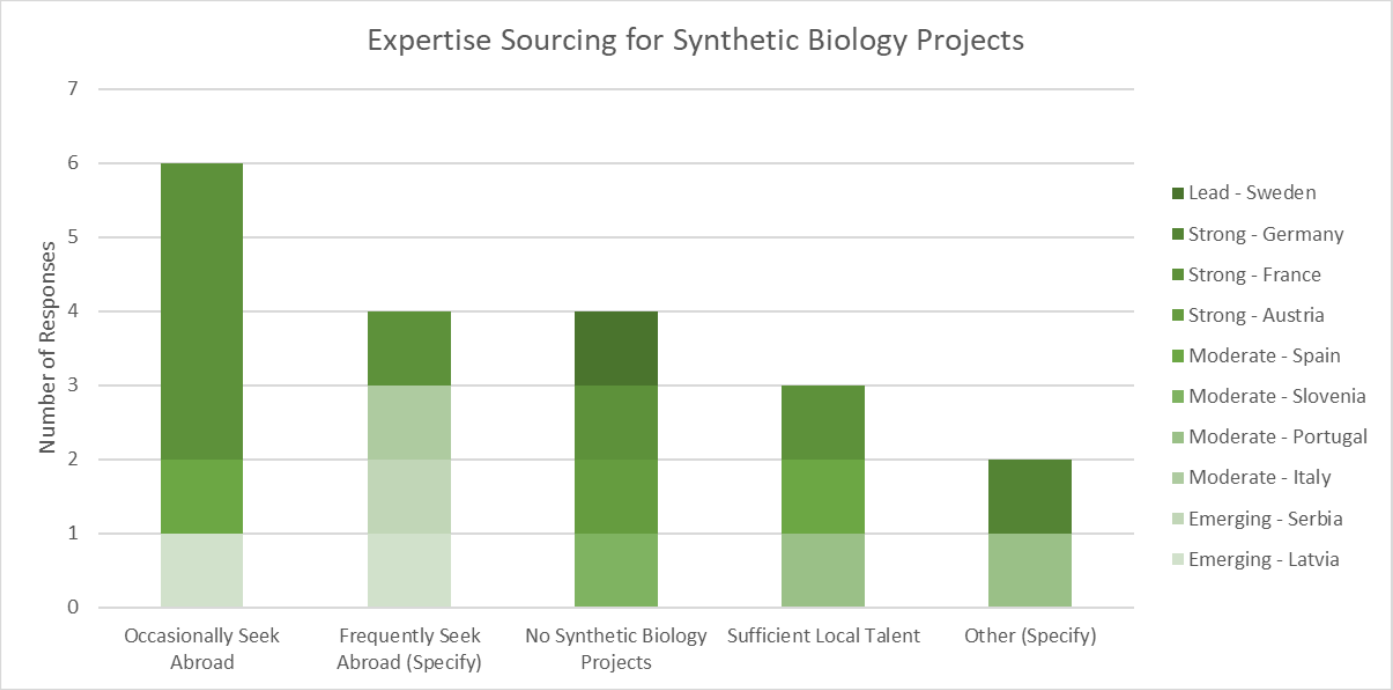

Options	Country	Eco-system	Number of Responses	Text Input
a. Yes, frequently (Please specify where)	Serbia	Emerging	1	EU countries (Italy, Germany, Austria, Spain…)
a. Yes, frequently (Please specify where)	Italy	Moderate	1	Scale up, purification
e. Other (Please specify)	Portugal	Moderate	1	A mixed balance is what we do
e. Other (Please specify)	Germany	Strong	1	yes, but due to scarcity of talent but due to special expertise in academia or start-ups

- **Emerging Ecosystem**: Occasionally seeks expertise from foreign countries, indicating a mix of local talent and occasional external sourcing.

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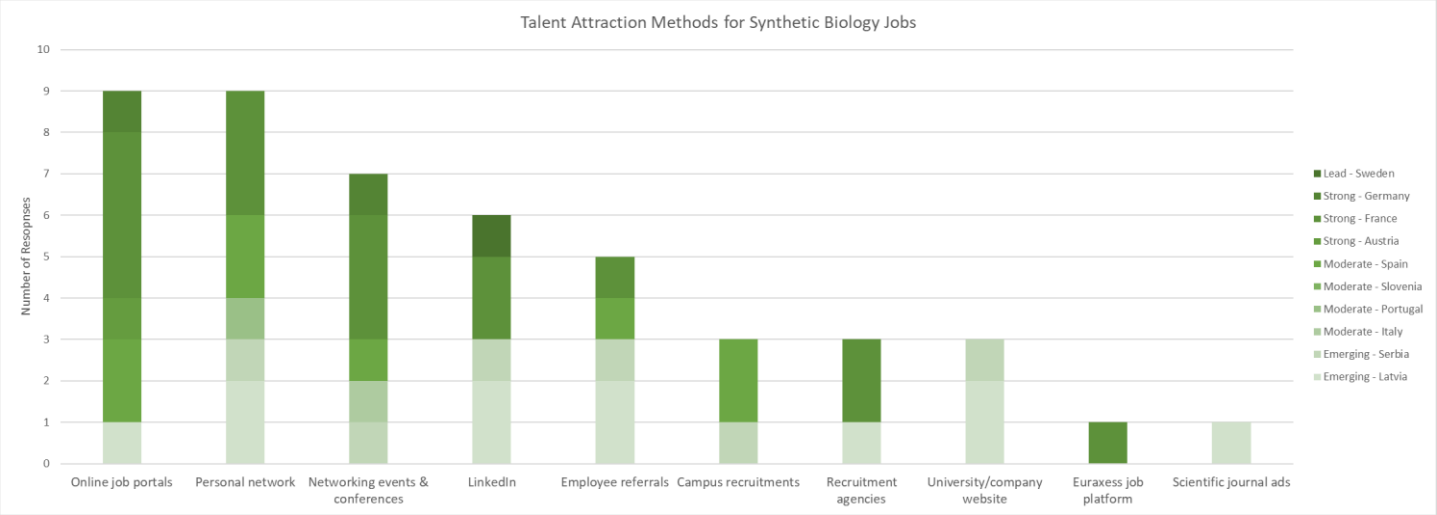
- **Moderate Ecosystem**: Demonstrates a frequent need to seek expertise from abroad due to local talent scarcity.
- **Strong Ecosystem**: Shows sufficient local talent with occasional abroad seeking.
- **Lead Ecosystem**: Like Strong, with sufficient local talent and occasional foreign expertise seeking.

7. How do you attract talent for synthetic biology-related job profiles? Please select all that apply:

a. Through job postings on online job portals
b. Through recruitment agencies
c. Through referrals from current employees
d. Through networking events and conferences
e. Through campus recruitments
f. Through Euraxess job platform
g. Through personal network
h. Through job advertisements in Nature, Science, or other scientific journals
i. Through LinkedIn
j. Through university/company website
k. Other (please specify)



- **Emerging Ecosystem**: Primarily attracts talent through online job portals and personal networks.

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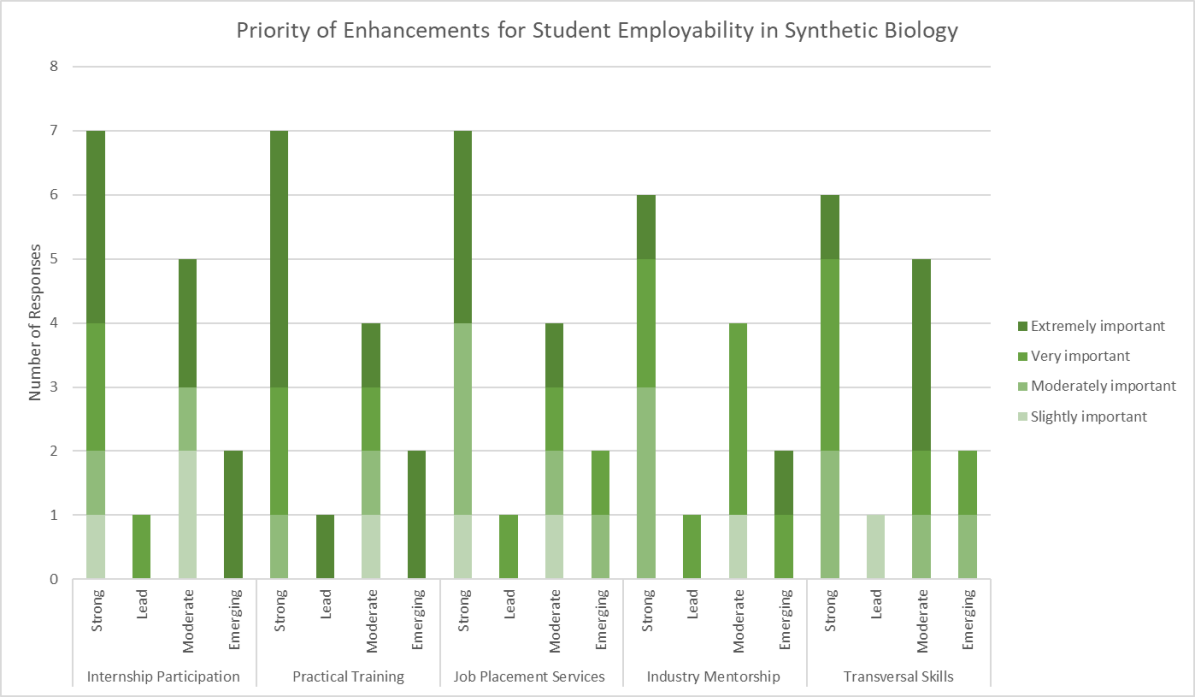
- **Moderate Ecosystem**: Utilizes a mix of channels, including networking events and LinkedIn.
- **Strong Ecosystem**: Employs a variety of methods, with a focus on personal networks and networking events.
- **Lead Ecosystem**: Like Strong, utilizing a range of channels for talent attraction.

8. *Please rate the importance of below options for enhancing students' employability in synthetic biology, which might be currently lacking in your country.*
   0-Not at all important, 1-Slightly important, 2-Moderately important, 3-Very important & 4-Extremely important.
   a. Introducing more practical training programs such as field work and wet-lab experience.
   b. Including industry professionals for mentorship and guidance in curriculum design.
   c. Encouraging student participation in industrial internships.
   d. Offering more job placement services.
   e. Offering more transversal skills such as IP training, management skills, financial planning, and forecasting.
   f. Other (Please specify).



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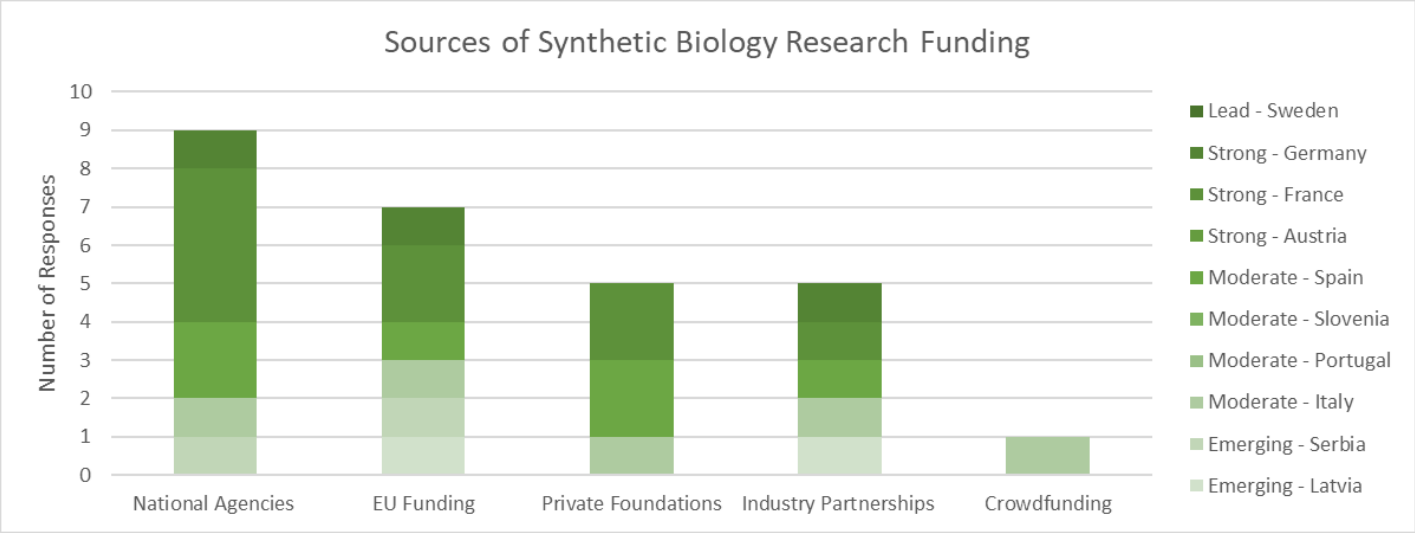
- **Emerging Ecosystem**: Rates internships, practical training, and job placement services as highly important for employability.
- **Moderate Ecosystem**: Focuses on internships and industry mentorship as key areas.
- **Strong Ecosystem**: Emphasizes the importance of internships, practical training, and industry mentorship.
- **Lead Ecosystem**: Similar emphasis on internships and practical training.

9. *In your experience, what sources of funding for synthetic biology research are available in your country?*
   a. National funding agencies, please specify:
   b. European Union funding, please specify:
   c. Private foundations, please specify:
   d. Industry partnerships where companies provide funding and expertise in exchange for access to the resulting technologies. Please specify:
   e. Crowdfunding please specify:



- **Emerging Ecosystem**: Shows a mix of national and EU funding, with some reliance on private foundations.
- **Moderate Ecosystem**: Like Emerging, with a balance between national agencies and EU funding.
- **Strong Ecosystem**: Leans more towards industry partnerships for funding.
- **Lead Ecosystem**: Demonstrates a diversified funding source, including national agencies, EU funding, and private foundations.

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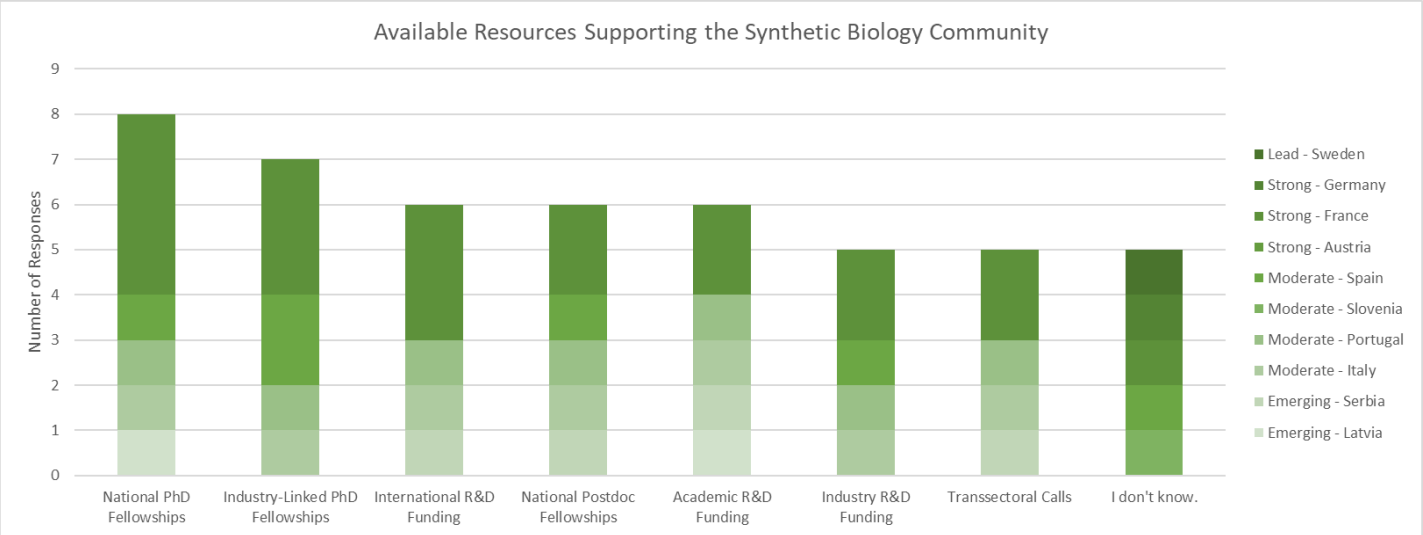
10. *What types of resources are available in your country to support the synthetic biology community? Please select all that apply.*
    a. National PhD fellowships.
    b. National PhD fellowships in collaboration with industry.
    c. National postdoc fellowships.
    d. National R&D project funding for academia.
    e. National R&D project funding for industry (SMEs).
    f. National collaborative trans
    g. International collaborative R&D funding programs.
    h. I don't know.



- **Emerging Ecosystem**: Indicates a range of resources, with a focus on national PhD fellowships and industry-linked opportunities.
- **Moderate Ecosystem**: Like Emerging, with an emphasis on international R&D funding.
- **Strong Ecosystem**: Highlights academic and industry R&D funding, along with trans sectoral calls.
- **Lead Ecosystem**: Shows a balanced approach, with a mix of national and international funding programs.

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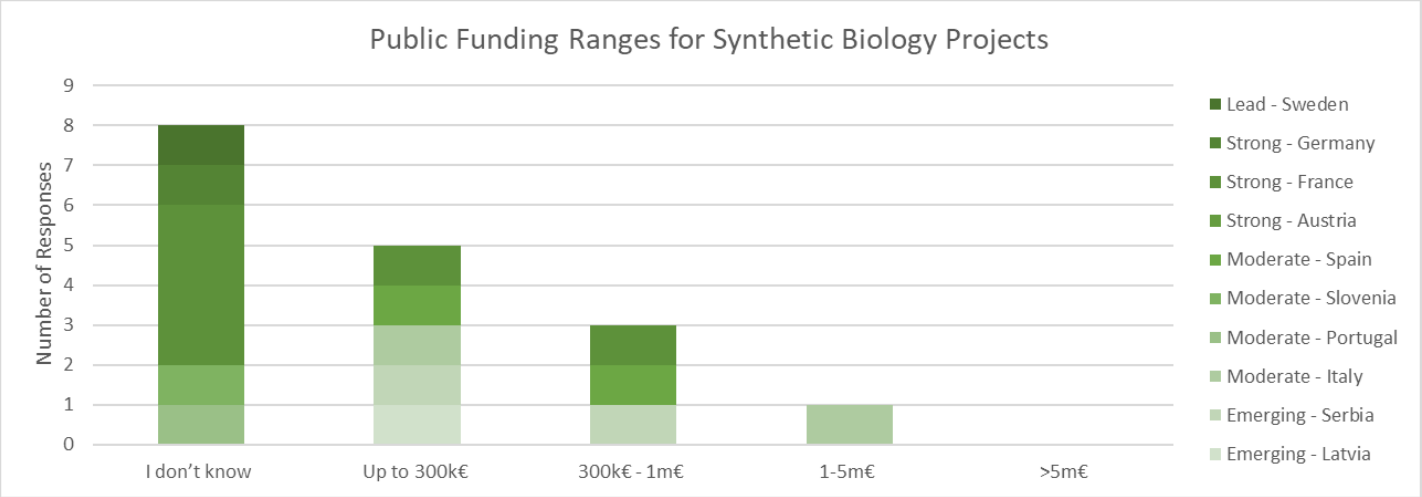
11. *Please select the range of available public funding for synthetic biology projects in your country or generalist funding that can be used for synthetic biology projects:*
    a. Up to 300k€
    b. 300k€ - 1m€
    c. 1-5m€
    d. >5m€
    e. I don't know.



- **Emerging Ecosystem**: Varied funding ranges, with a focus on up to 300k€ and 1-5m€.
- **Moderate Ecosystem**: Demonstrates a similar pattern, with funding mostly in the 300k€ - 1m€ range.
- **Strong Ecosystem**: Exhibits larger funding ranges, including options beyond 5m€.
- **Lead Ecosystem**: Like Strong, with a wider range of funding options available.

12. *Which of the following types of private funding is currently most active in your country to support synthetic biology research and development? Please select all that apply.*
    a. Business angels
    b. Venture capital (VC)
    c. corporate venture capital (CVC)
    d. Family offices
    e. Private equity
    f. Other (please specify)

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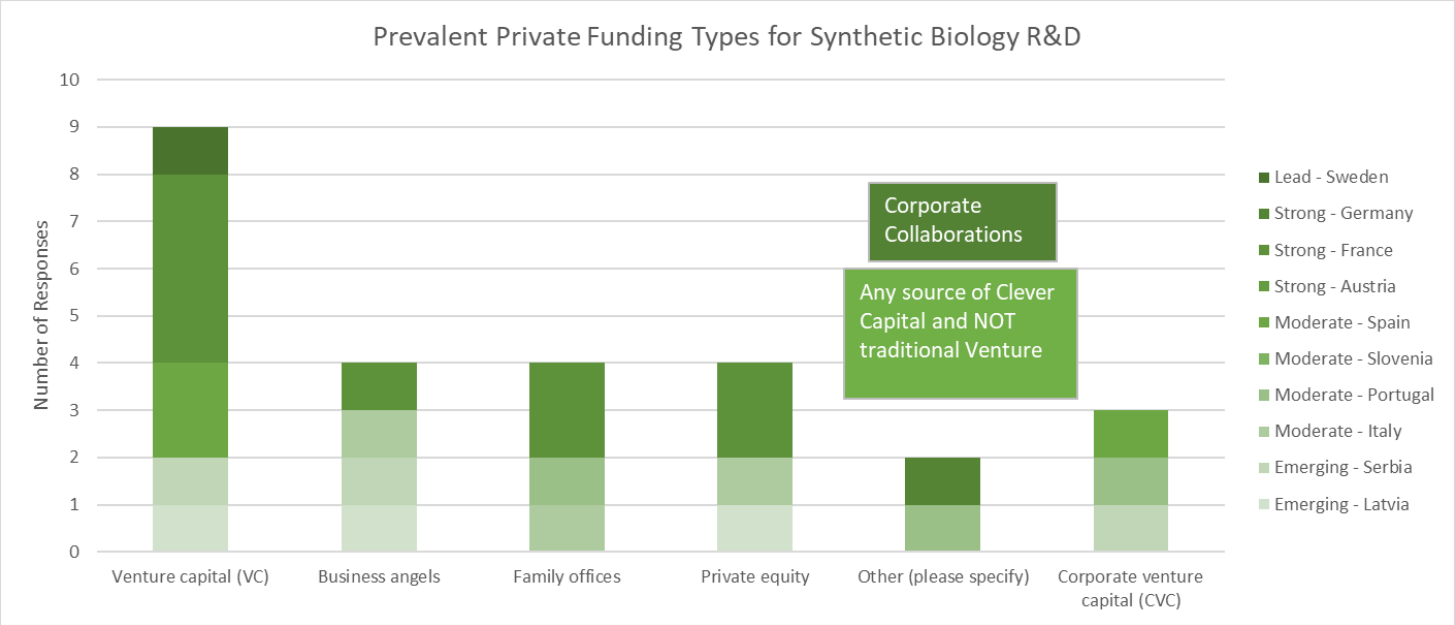

- **Emerging Ecosystem**: Focuses on venture capital and business angels for private funding.
- **Moderate Ecosystem**: Like Emerging, with a lean towards venture capital.
- **Strong Ecosystem**: Demonstrates a variety of funding sources, including corporate collaborations.
- **Lead Ecosystem**: Emphasizes venture capital as a primary source of private funding.

13. *When considering an investment in a synthetic biology startup, which of the following factors do you think are most important? Please select all that apply:*
    a. The team's experience and expertise
    b. The potential market size for the product or service
    c. The stage of development of the technology
    d. The intellectual property portfolio of the startup
    e. Location or region where the company is situated.
    f. Other (please specify)

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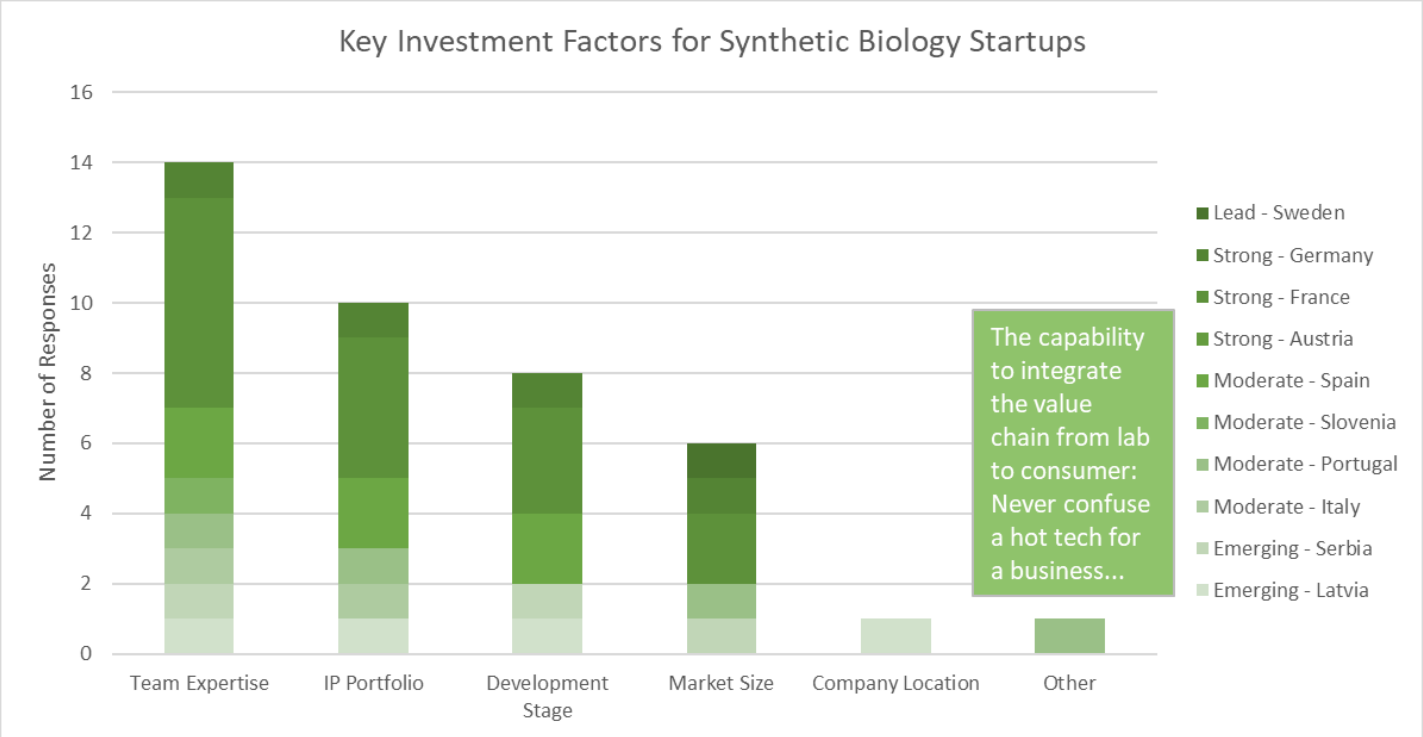

- **Emerging Ecosystem**: Highlights team expertise, IP portfolio, and development stage as key investment factors.
- **Moderate Ecosystem**: Like Emerging, with an additional emphasis on market size.
- **Strong Ecosystem**: Focuses on team expertise and IP portfolio as major considerations.
- **Lead Ecosystem**: Like Strong, with a balanced approach to investment factors.

14. *What do you think are the most significant obstacles that deter investors from investing in a particular synthetic biology start-up? Select all that apply.*
    a. Regulatory compliance issues
    b. Intellectual property concerns
    c. financial risks
    d. technical feasibility
    e. Lack of industry experience in the team
    f. public perception
    g. Market competition
    h. Commercialization challenges
    i. long development time

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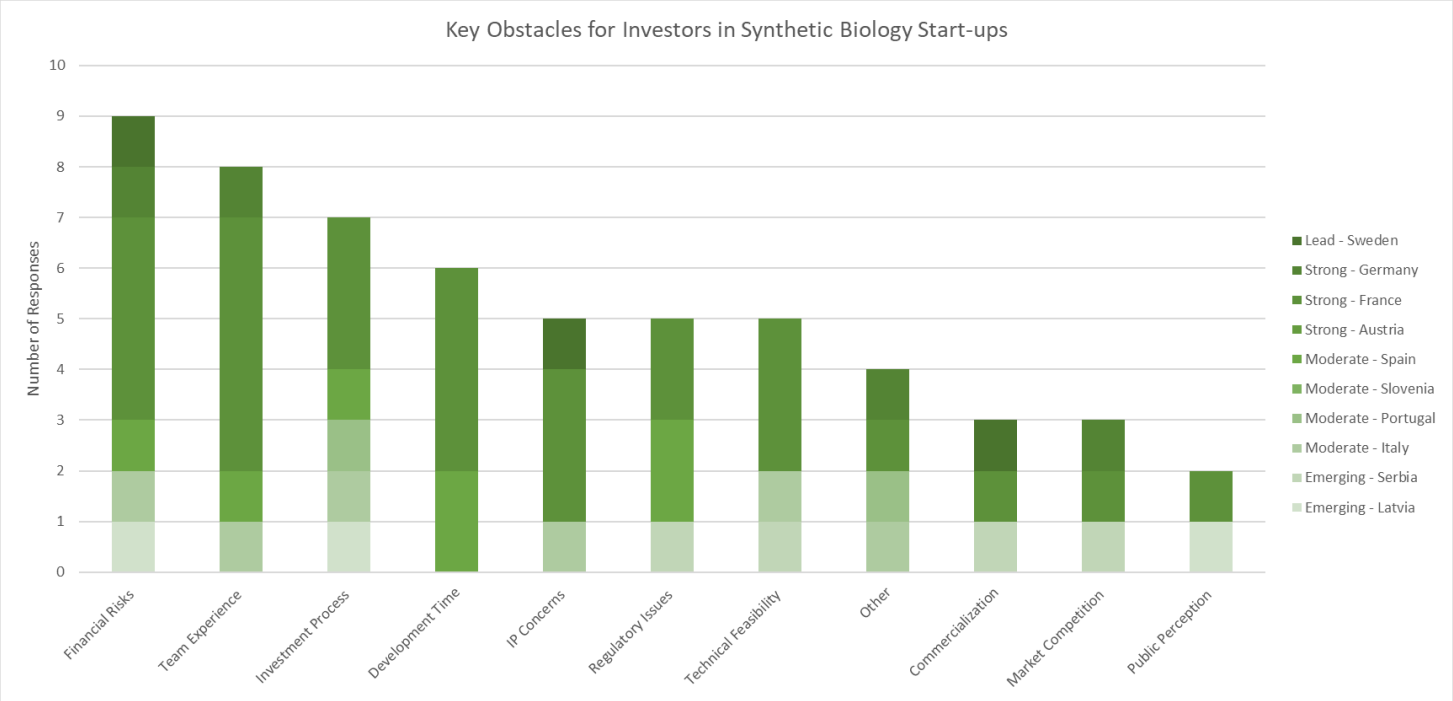
j. Lack of understanding of investment process in deep tech/synbio startups
k. Others (Please specify)



- **Emerging Ecosystem**: Identifies financial risks and team experience as significant obstacles for investors.
- **Moderate Ecosystem**: Like Emerging, with additional concerns about the investment process and development time.
- **Strong Ecosystem**: Highlights financial risks, team experience, and IP concerns as major deterrents.
- **Lead Ecosystem**: Focuses on financial risks and technical feasibility as key obstacles.

15. *Which of the below support/resources do synthetic biology companies currently lack in your country? Please rank the below options on the level of importance: 0-Not at all Important, 1 – Slightly Important, 2 – Moderately Important, 3 – Very Important, 4 – Extremely Important.*

    a. Access to funding and investment
    b. Mentorship and guidance from industry experts (IP, scale-up)
    c. Access to talent and expertise

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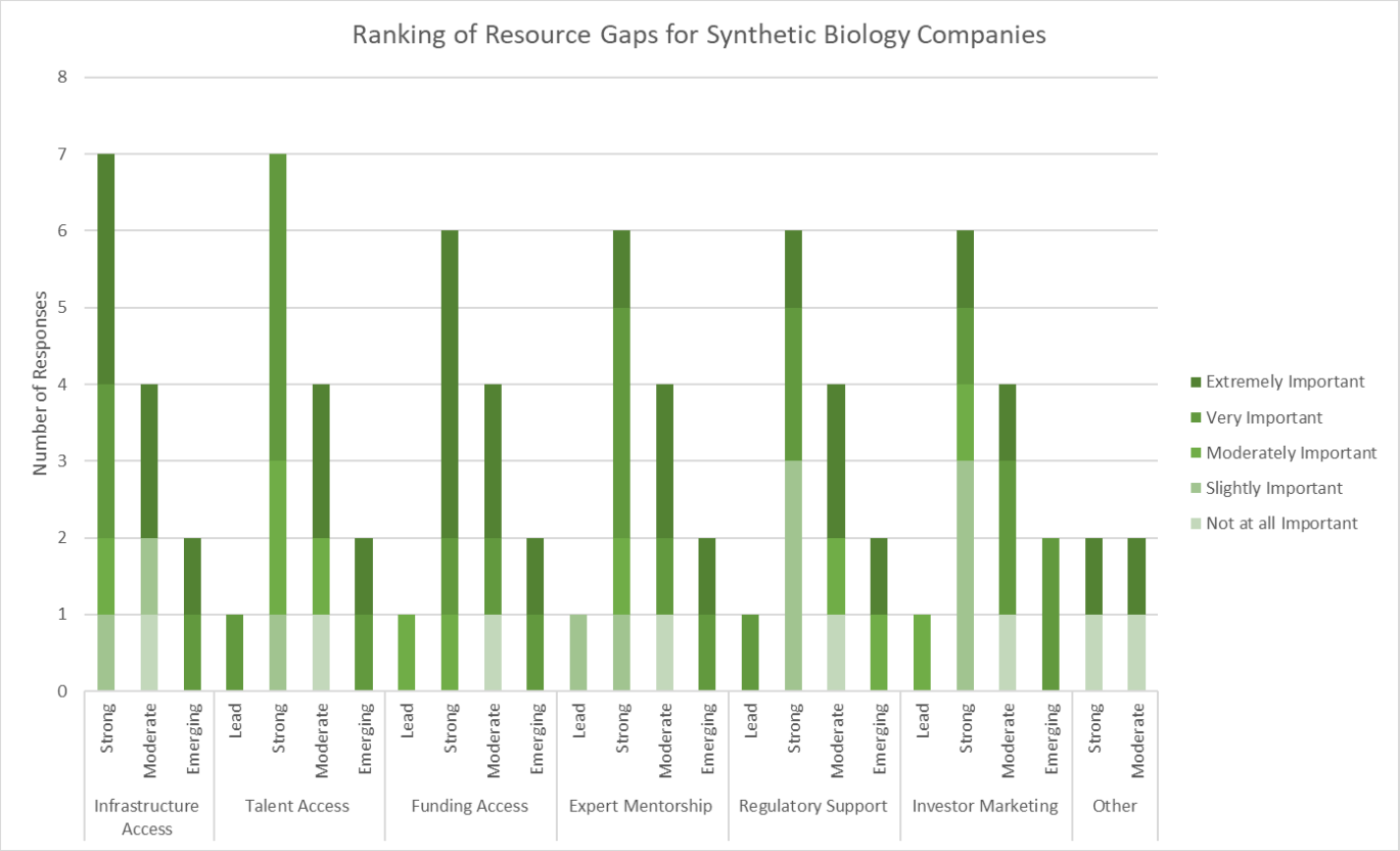
d. Regulatory and legal support
e. Access to infrastructure with relevant equipment and facilities.
f. Marketing for better visibility to investors.
g. Other (please specify)



- **Emerging Ecosystem**: Rates infrastructure access and talent access as very important resource gaps.
- **Moderate Ecosystem**: Similar focus on talent and funding access.
- **Strong Ecosystem**: Emphasizes the importance of expert mentorship and regulatory support.
- **Lead Ecosystem**: Like Strong, with a strong focus on infrastructure and talent access.

16. *Which of the below allow synthetic biology companies to better connect with investors and funding opportunities in your country? Select all that apply:*
a. Through networking events and conferences

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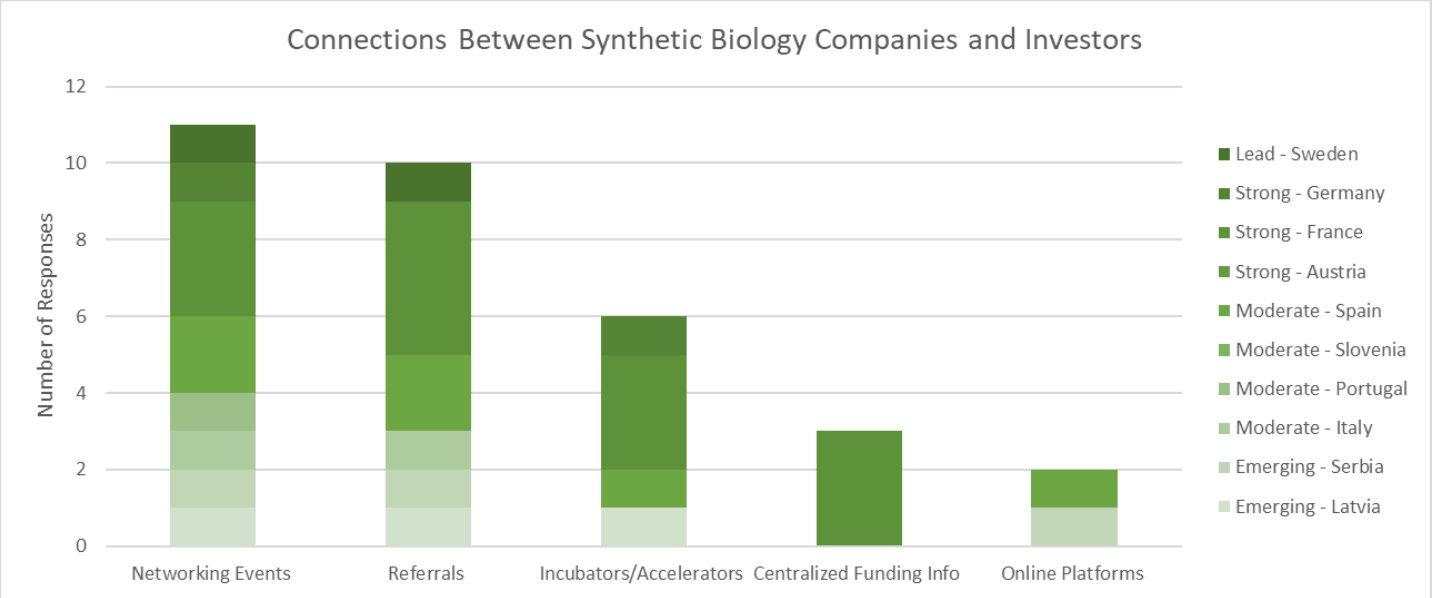
b. Through online platforms and resources
c. Through incubators and accelerators
d. Through introductions and referrals
e. Through a centralised platform with information regarding all funding opportunities.
f. Other (please specify)
g. Would you like to see a particular method added or developed for this purpose, please specify:



- **Emerging Ecosystem**: Utilizes networking events and referrals as primary methods for connecting with investors.
- **Moderate Ecosystem**: Like Emerging, with an emphasis on incubators/accelerators.
- **Strong Ecosystem**: Focuses on networking events and centralized funding information.
- **Lead Ecosystem**: Like Strong, utilizing a variety of methods for investor connections.

17. *Which of the below is currently lacking by start-ups to better attract investors in your country? Please select up to 4 most important choices from the options below.*
    a. *Developing clear and concise messaging of their company mission, vision, and purpose.*
    b. *Creating and engaging with informative content on their impact.*
    c. *Leveraging social media and digital marketing to reach wider audiences.*
    d. *Hosting events and presentations on a regular basis to attract investors.*

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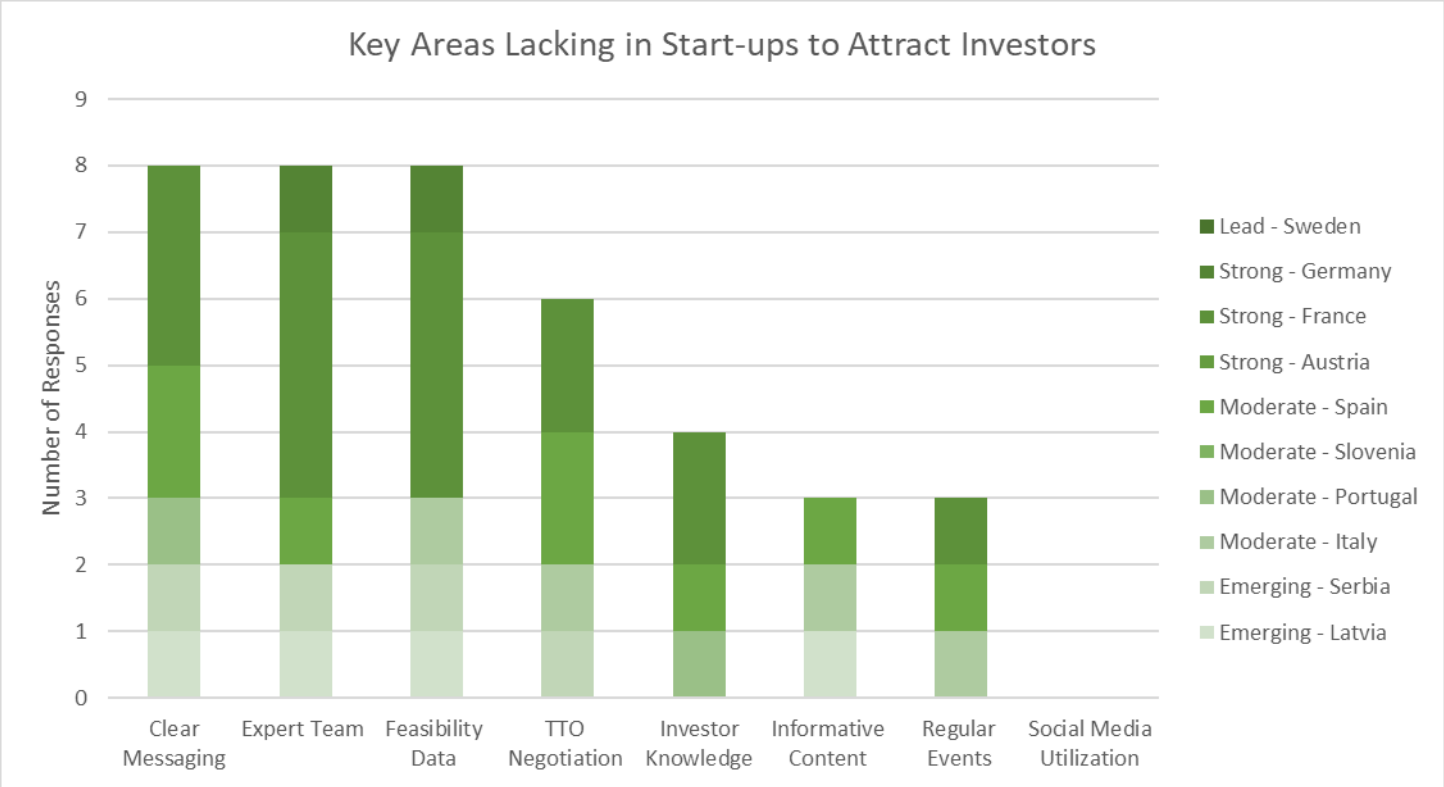
e. *Preliminary data convincing feasibility to potential investors.*
f. *A strong team with key expertise.*
g. *Smooth negotiation with the Technology Transfer Office (TTO).*
h. *Sufficient knowledge of the investors' portfolio including investment criteria, diversification strategy and risk management approach.*
i. *None of the above.*
j. *Other (please specify)*



- **Emerging Ecosystem**: Highlights the importance of clear messaging and an expert team for attracting investors.
- **Moderate Ecosystem**: Like Emerging, with additional emphasis on feasibility data.
- **Strong Ecosystem**: Focuses on clear messaging, team expertise, and feasibility data.
- **Lead Ecosystem**: Like Strong, with a variety of factors considered important.

18. *In your experience, during which stage does an entrepreneur require the most assistance to successfully establish their own company? Please select all that apply.*

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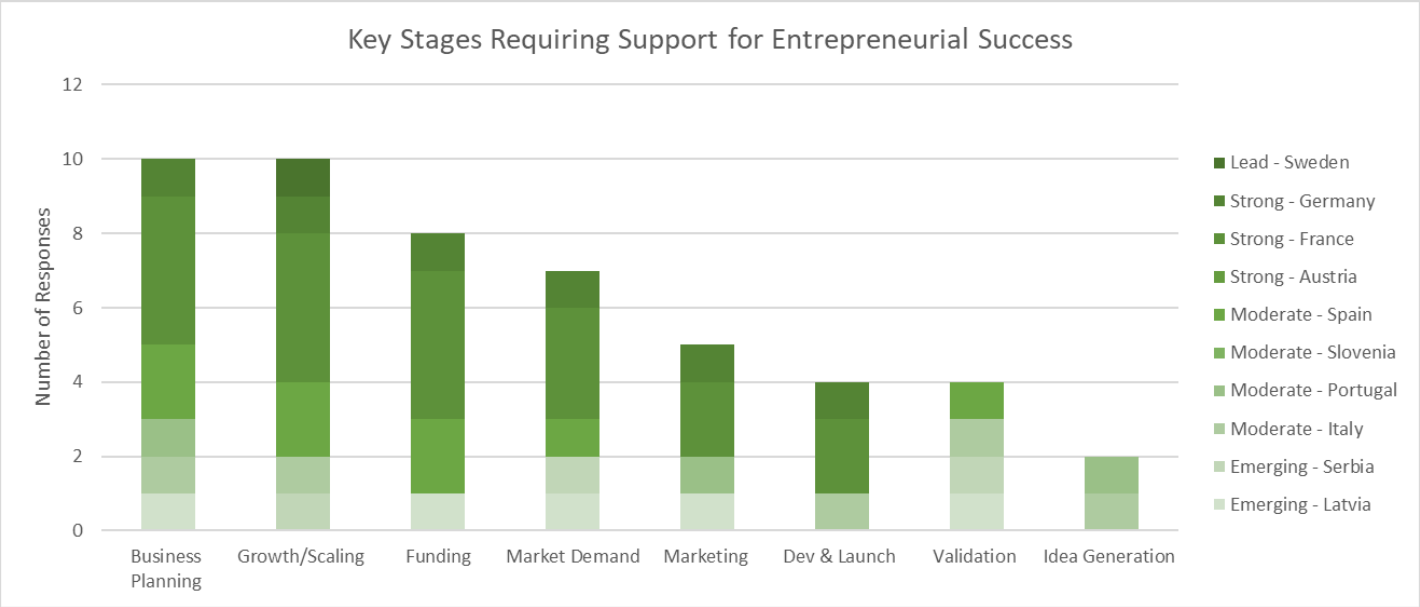
a. Idea generation
b. Funding
c. Business planning
d. Marketing
e. Development and Launch
f. Validation
g. Growth/Scale
h. Identifying market demand for the technology.



- **Emerging Ecosystem**: Identifies business planning and growth/scaling as critical stages requiring assistance.
- **Moderate Ecosystem**: Like Emerging, with additional focus on funding and market demand.
- **Strong Ecosystem**: Highlights business planning, funding, and growth/scaling as key stages.
- **Lead Ecosystem**: Like Strong, with a balanced view across various stages.

19. *How does your country's government support synthetic biology companies? Please select all that apply:*
a. By providing funding and grant opportunities.

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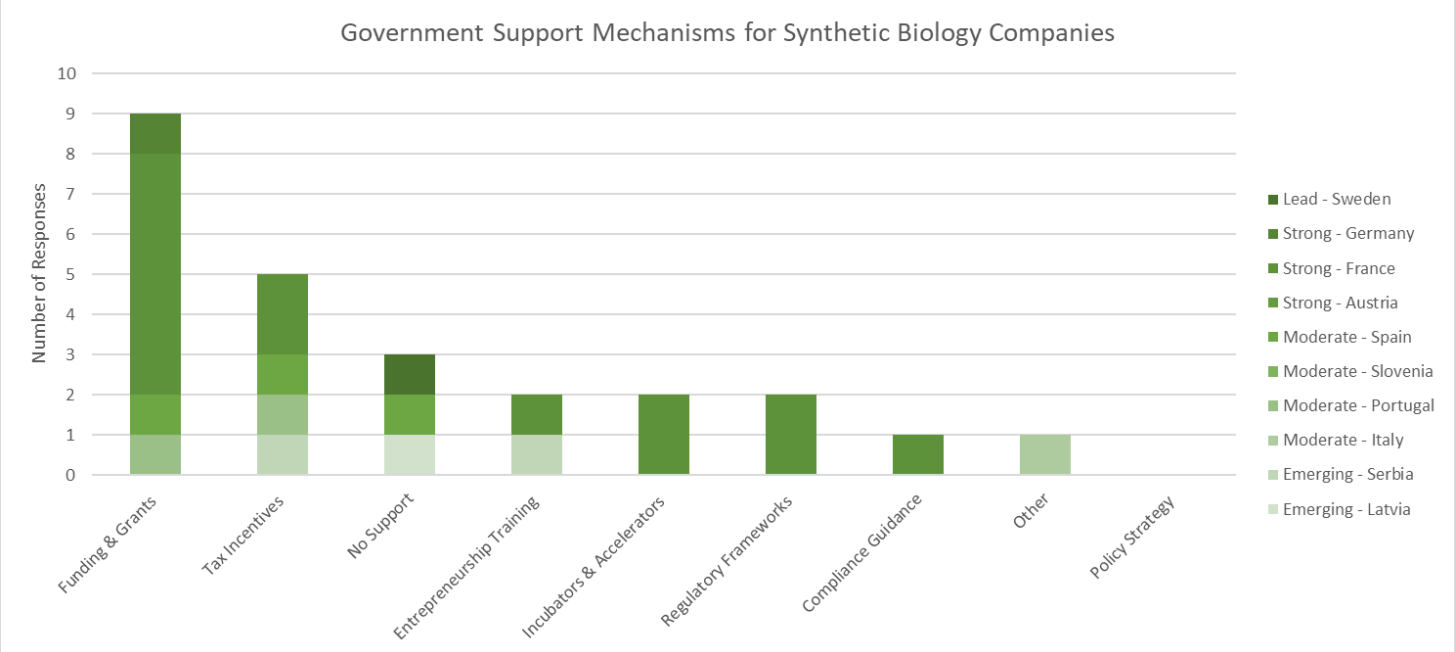
b. By providing tax incentives for investors (please specify any improvements that could be made to these incentives to better support equity financing).
c. By creating regulatory frameworks that promote innovation and growth (please provide an example).
d. By providing guidance and support on compliance with relevant laws and regulations (please specify which laws and regulations, and any improvements that could be made to the guidance).
e. By establishing and supporting incubators and accelerator programs to help start-ups grow and succeed (please provide details on how these programs are established and supported, their impact on start-ups, and any need for further support such as grants or tax incentives).
f. Strategy and policy preparation with relevant stakeholders
g. Allocation of resources for entrepreneurship training and other relevant competence development activities
h. None of the above.
i. Other (please specify)



- **Emerging Ecosystem**: Shows reliance on funding & grants and tax incentives for government support.

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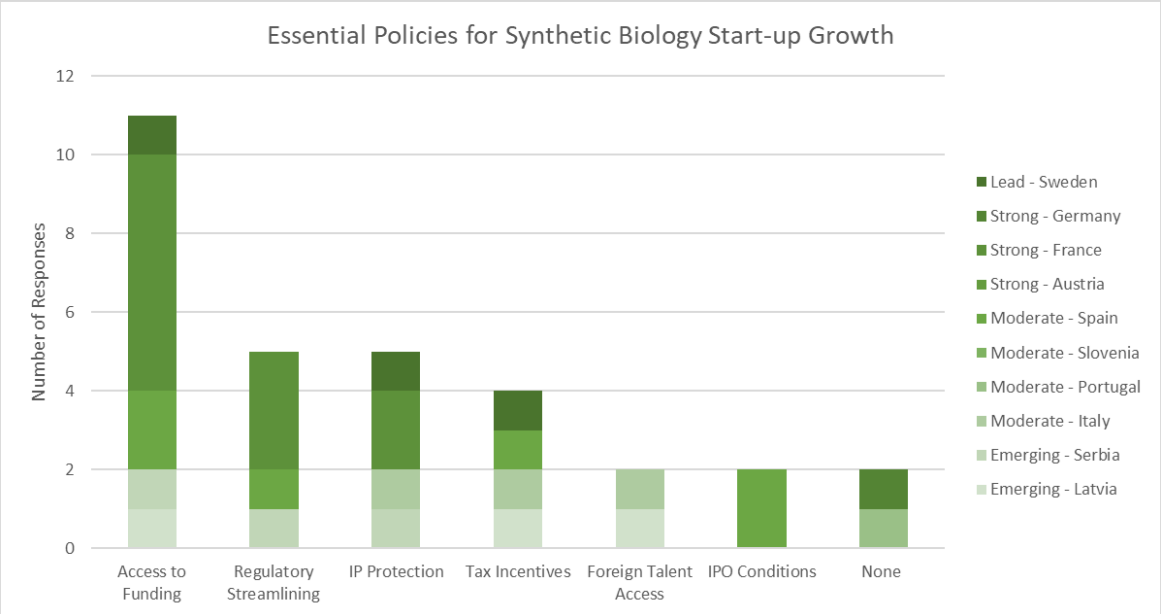
- **Moderate Ecosystem**: Like Emerging, with additional emphasis on entrepreneurship training.
- **Strong Ecosystem**: Focuses on funding & grants and incubators/accelerators.
- **Lead Ecosystem**: Like Strong, with a variety of government support mechanisms.

20. *What kind of policies or regulations do you think are currently lacking but necessary to support the growth of synthetic biology start-ups in your country? Please select up to three most important choices.*
    a. Expedited intellectual property protection for innovators, such as copyrights, trademarks, patents.
    b. Streamlined regulatory processes to make market entry easier.
    c. Easier and timely access to substantive funding for innovation and entrepreneurs.
    d. Tax incentives for investors such as tax breaks for R&D, reduced corporate tax rates for synthetic.
    e. Improved conditions for Initial Public Offerings (IPO's) to allow a more secure and easier exit for investors.
    f. Simplified and streamlined access to foreign talent.
    g. None of the above
    h.Other (please specify)



- **Emerging Ecosystem**: Emphasizes access to funding and regulatory streamlining as key policy needs.

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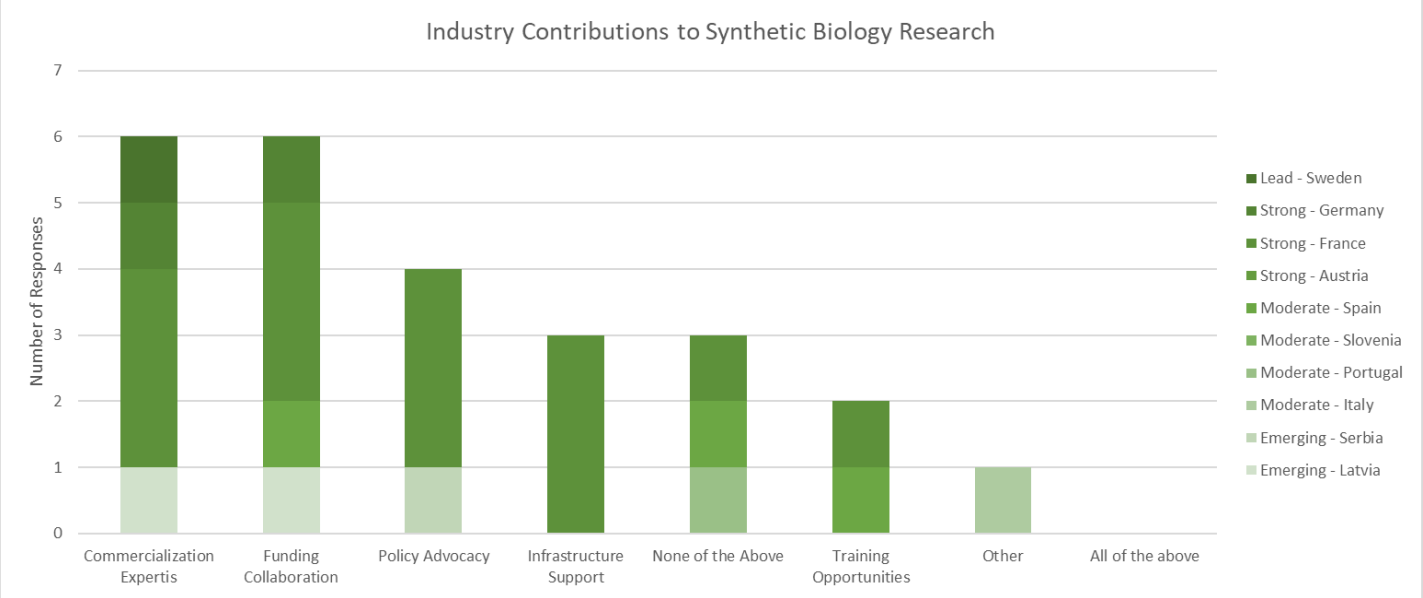
- **Moderate Ecosystem**: Like Emerging, with additional focus on IP protection.
- **Strong Ecosystem**: Highlights the need for streamlined regulations and tax incentives.
- **Lead Ecosystem**: Like Strong, with a balanced approach to policy needs.

21. *What role does industry play in promoting synthetic biology research in your country? Select all that apply:*
    a. Fund research projects by collaborating with academia.
    b. Provide infrastructure and resources for academic researchers.
    c. Provide training and education opportunities.
    d. Expertise in scaling up and commercializing new products.
    e. Advocate for policies and regulations that support the development and commercialization of Synthetic Biology technologies.
    f. All the above.
    g. None of the above.
    h. Other (please specify)



- **Emerging Ecosystem**: Identifies commercialization expertise and funding collaboration as industry's primary roles.
- **Moderate Ecosystem**: Like Emerging, with additional focus on policy advocacy.
- **Strong Ecosystem**: Demonstrates a range of roles, including infrastructure support and training opportunities.

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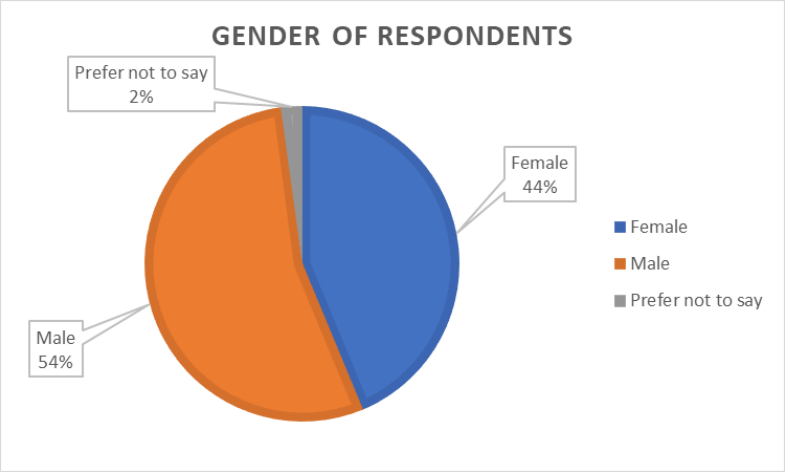
- **Lead Ecosystem**: Like Strong, with a balanced approach to industry roles.

6.1.1.5 STAKEHOLDER GROUP: RESEARCH/EDUCATIONAL INSTITUTION

Demographics

1. *Gender of Respondents*



2. *Countries & Eco-systems of Respondents*

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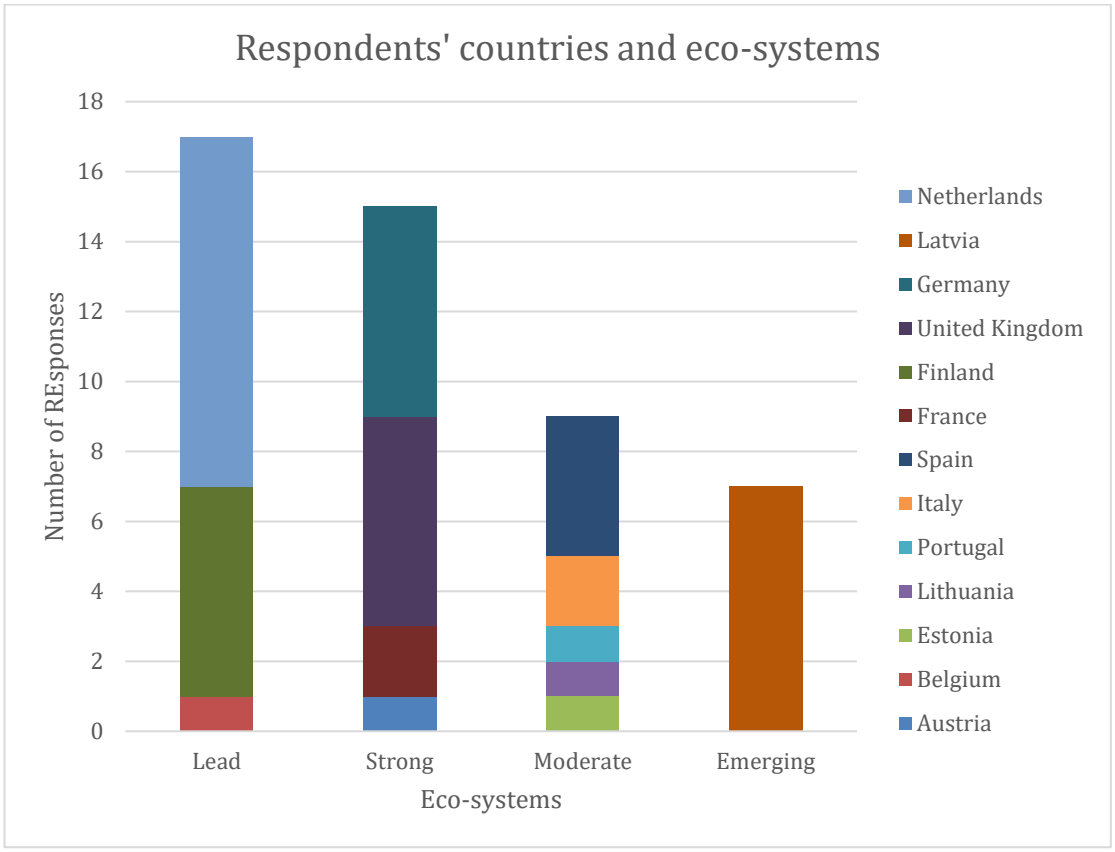

3. *Name of the workplace*

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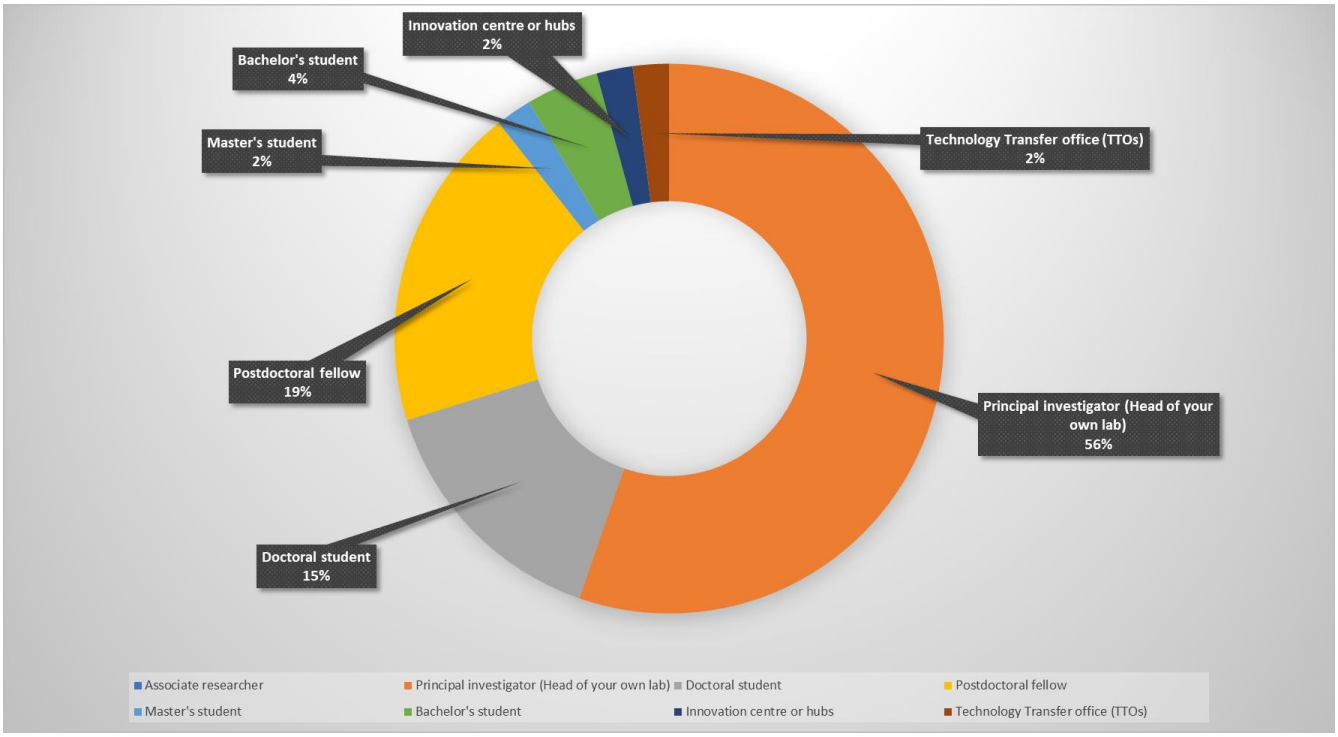
4. Role of the respondents



#	Role	%	Count
1	Associate researcher	0.00%	0
3	Principal investigator (Head of your own lab)	55.32%	26
4	Doctoral student	14.89%	7
5	Postdoctoral fellow	19.15%	9
6	Master's student	2.13%	1
7	Bachelor's student	4.26%	2
8	Innovation centre or hubs	2.13%	1
10	Technology Transfer office (TTOs)	2.13%	1
	Total	100%	47

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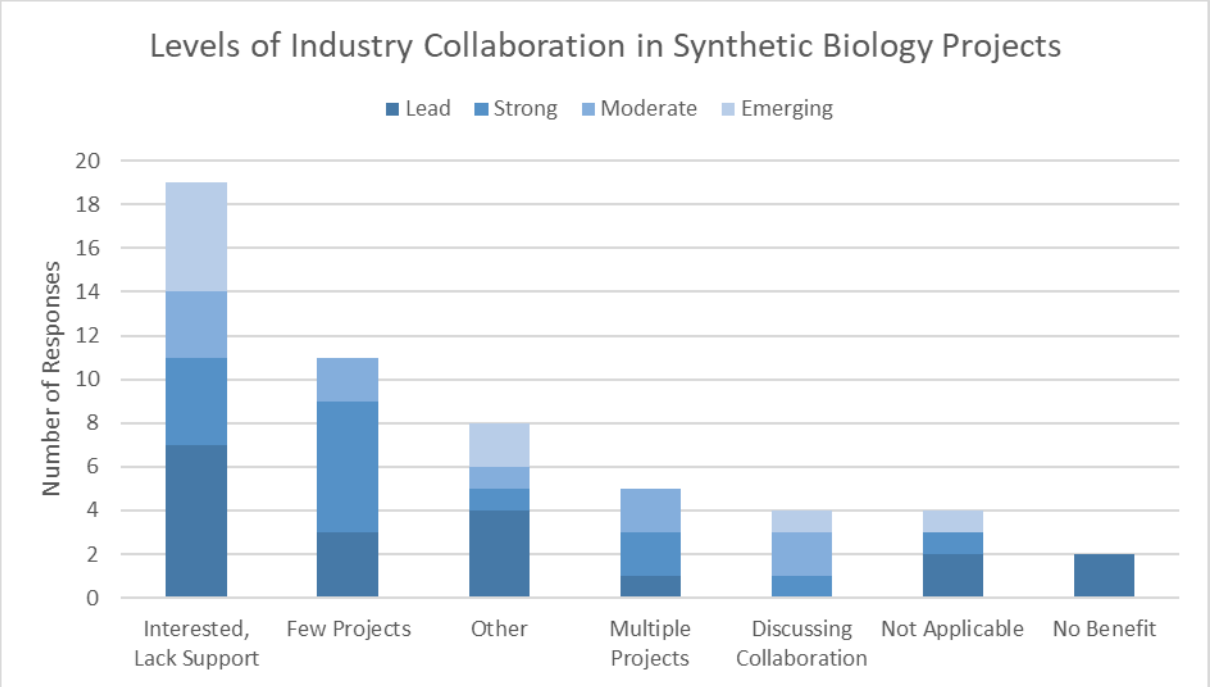
Questions

1. *How would you rate your level of collaboration with industry involving synthetic biology projects? Please choose the most relevant option:*

a. *Multiple joint projects*
b. *Few joint projects*
c. *In discussion to start a collaboration*
d. *Interested but lack support/resources.*
e. *Collaboration not applicable*
f. *No perceived benefit in engagement*
g. *Other (please specify):*



Collaboration with Industry in Synthetic Biology Projects

- **Interested, Lack Support:** The highest response in the Lead ecosystem (7 responses), while Moderate and Emerging ecosystems also show notable responses (3 and 5 respectively).

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- **Few Projects:** Strong ecosystem shows the highest response (6 responses), with Moderate and Lead ecosystems having 2 and 3 responses respectively. No responses from the Emerging ecosystem.
- **Other:** The Lead ecosystem shows a notable number of responses (4), while other ecosystems have 1 or 2 responses each.
- **Multiple Projects:** Responses are relatively low across all ecosystems, with the highest being 2 in both the Strong and Moderate ecosystems.
- **Discussing Collaboration**: Moderate ecosystem shows the highest response (2), with one response each from Strong and Emerging. No responses from Lead.
- **Not Applicable:** Lead and Strong ecosystems show minimal responses (2 and 1 respectively).
- **No Benefit:** Only the Lead ecosystem shows responses (2), indicating a perception of no benefit in engagement.

2. *What resources are available for research at your institution? Select all that apply:*
   a. There are new or renovated lab facilities equipped with specialized synthetic biology equipment available for use.
   b. My institution has collaborations with industry for access to cutting-edge equipment and technology.
   c. My institution has applied or obtained grants to purchase new equipment specifically for Synthetic Biology research. Please specify the funding agencies you have applied or obtained grant from:
   d. We have access to shared facilities available for interdisciplinary research across departments or institutions, including those that may be used for synthetic biology.
   e. We have partnerships with other institutions for resource and expertise sharing.
   f. We have access to a bio foundry.
   g. We have very limited access to the state-of-the-art laboratory facilities and only basic equipment is available to use.
   h. Other (please specify)

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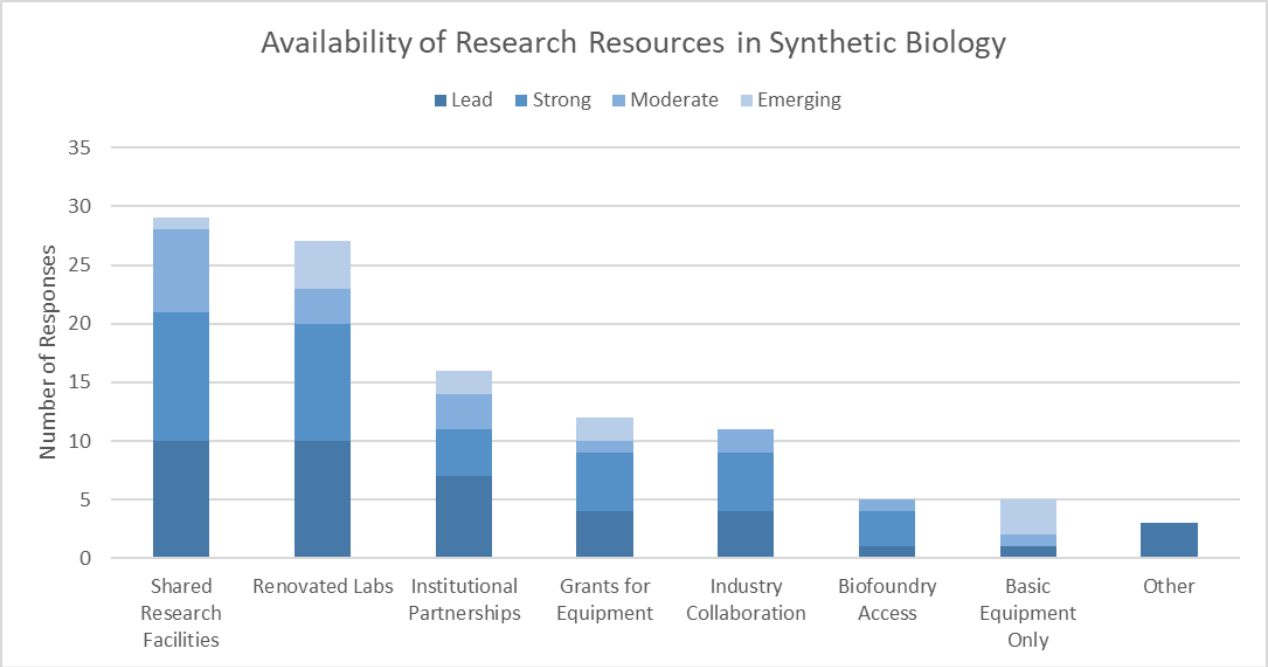

Resources Available for Research at Institutions in Synthetic Biology

- **Renovated Labs:** Strong presence in the Lead and Strong ecosystems (10 responses each). Moderate ecosystem shows some engagement (3 responses), while Emerging ecosystem has a slightly higher presence (4 responses).
- **Industry Collaboration**: Relatively strong in the Lead and Strong ecosystems (4 and 5 responses, respectively). Moderate ecosystem has minimal engagement (2 responses), and no responses from the Emerging ecosystem.
- **Grants for Equipment:** Similar distribution as Industry Collaboration, with Lead and Strong ecosystems showing more activity (4 and 5 responses respectively). Emerging ecosystem shows some activity (2 responses), while the Moderate ecosystem has minimal engagement.
- **Shared Research Facilities**: Highly utilized in the Lead and Strong ecosystems (10 and 11 responses, respectively). Notable presence in the Moderate ecosystem (7 responses), but minimal in the Emerging ecosystem.
- **Institutional Partnerships:** Lead ecosystem shows a notable number of responses (7), with Strong ecosystem having moderate engagement (4 responses). Moderate and

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Emerging ecosystems show some level of engagement (3 and 2 responses, respectively).

- **Bio foundry Access:** Responses are minimal across all ecosystems, with the Strong ecosystem showing a slightly higher count (3 responses).
- **Basic Equipment Only:** The Emerging ecosystem shows a notable limitation (3 responses), indicating reliance on basic equipment. Minimal responses from other ecosystems, with Lead and Moderate ecosystems having one response each.
- **Other**: Responses are relatively low, with the Lead ecosystem showing a few diverse resources (3 responses).

In summary, the Lead and Strong ecosystems appear to have a broader range of resources available for synthetic biology research, including renovated labs, industry collaborations, and access to shared research facilities. The Moderate ecosystem shows some engagement in most categories, while the Emerging ecosystem is notably limited in several areas, particularly in industry collaboration and shared research facilities.

3. *Which of the following are available at your institution? Select all that apply:*
   a. One-on-one mentoring program with faculty members who specialize in synthetic biology, providing personalized guidance and support.
   b. Access to cutting-edge synthetic biology research facilities and equipment, allowing students to conduct independent research projects.
   c. A dedicated synthetic biology club or student organization, providing opportunities for peer mentorship and collaboration on projects.
   d. Involvement in a synthetic biology competition or challenge, providing a platform for students to showcase their skills and knowledge.
   e. Regular opportunities for networking with synthetic biology industry professionals, allowing students to make connections and learn about potential career paths.
   f. Support for attending synthetic biology-related conferences or events outside of the institution, providing exposure to a wider range of perspectives and opportunities.
   g. Training in the ethical and societal implications of synthetic biology, preparing students to consider the broader impacts of their work.
   h. Opportunities for public engagement and science communication related to synthetic biology, allowing students to share their research and knowledge with a broader audience.
   i. Support for pursuing entrepreneurship or starting a synthetic biology-related business, including access to funding, mentorship, and other resources.

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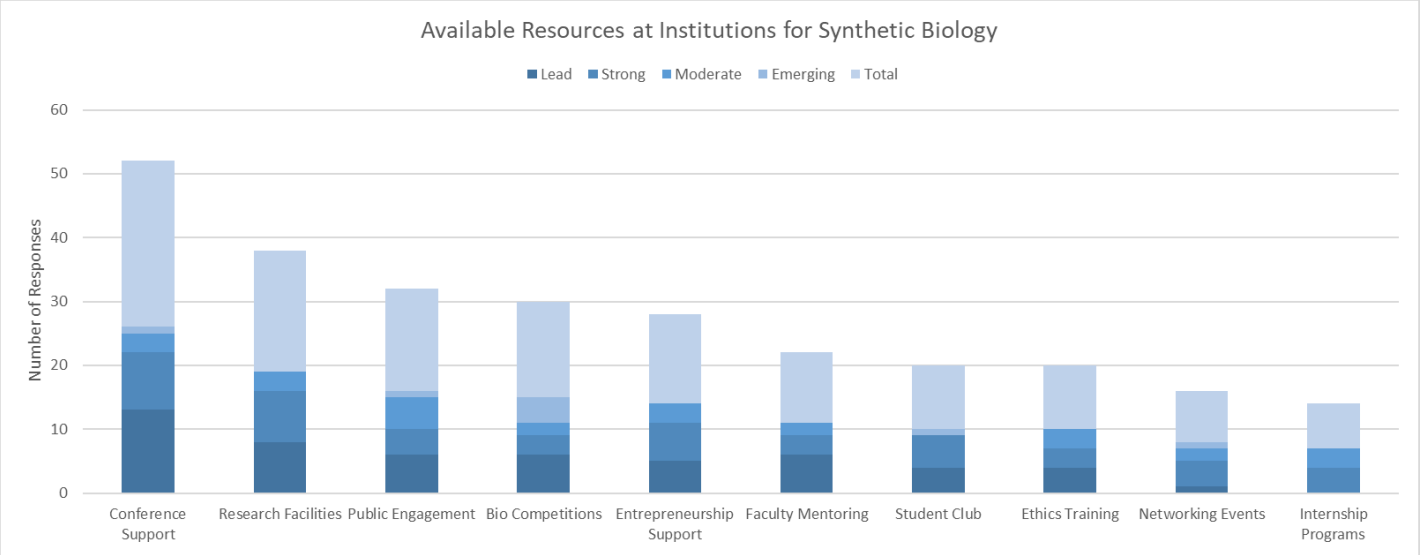
j. Internship programs specifically focused on synthetic biology, providing students with practical experience and industry connections.



Available Facilities at Institutions for Synthetic Biology

- Conference Support: Lead ecosystem leads with 13 responses, followed by Strong with 9. Moderate and Emerging ecosystems show fewer responses.
- Research Facilities: Both Lead and Strong ecosystems have 8 responses each, indicating good access to research facilities.
- Public Engagement: Lead ecosystem shows a notable number of responses (6), followed by Moderate (5). Other ecosystems show fewer responses.
- Bio Competitions: Responses are relatively even across ecosystems, with Lead and Strong having 6 and 3 respectively, and Emerging ecosystem showing higher engagement (4).
- Entrepreneurship Support: Strong ecosystem shows a significant number of responses (6), followed by Lead (5).
- Faculty Mentoring: Responses are moderate across ecosystems, with Lead showing the highest number (6).
- Student Club: Responses are evenly distributed, with Strong ecosystem showing a slightly higher number (5).
- Ethics Training: Responses are evenly spread across Lead, Strong, and Moderate ecosystems.

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- Networking Events: Minimal responses, with Strong ecosystem showing slightly higher engagement (4).
- Internship Programs: Strong ecosystem shows a notable number of responses (4), indicating better opportunities for practical experience.

4. *In your opinion, how does your academic institution support education in synthetic biology? Select all that apply:*
   a. By developing a curriculum on synthetic biology.
   b. Creating educational materials like courses, videos, infographics, and brochures on synthetic biology.
   c. Organize workshops (bio-hackathons), pitch competitions and academic seminars on synthetic biology at national level.
   d. Organize international conferences to help students engage with the international community.
   e. Collaborate with other institutions or organizations to share synthetic biology resources and expertise in the form of mandatory internships as part of the curriculum.
   f. Establish a synthetic biology club or organization on campus to promote education and awareness.
   g. Encourage students to participate in synthetic biology research projects if not part of the existing curriculum.
   h. Host guest speakers or experts in synthetic biology more than twice a year.
   i. Use social media to share information about synthetic biology research at the university.

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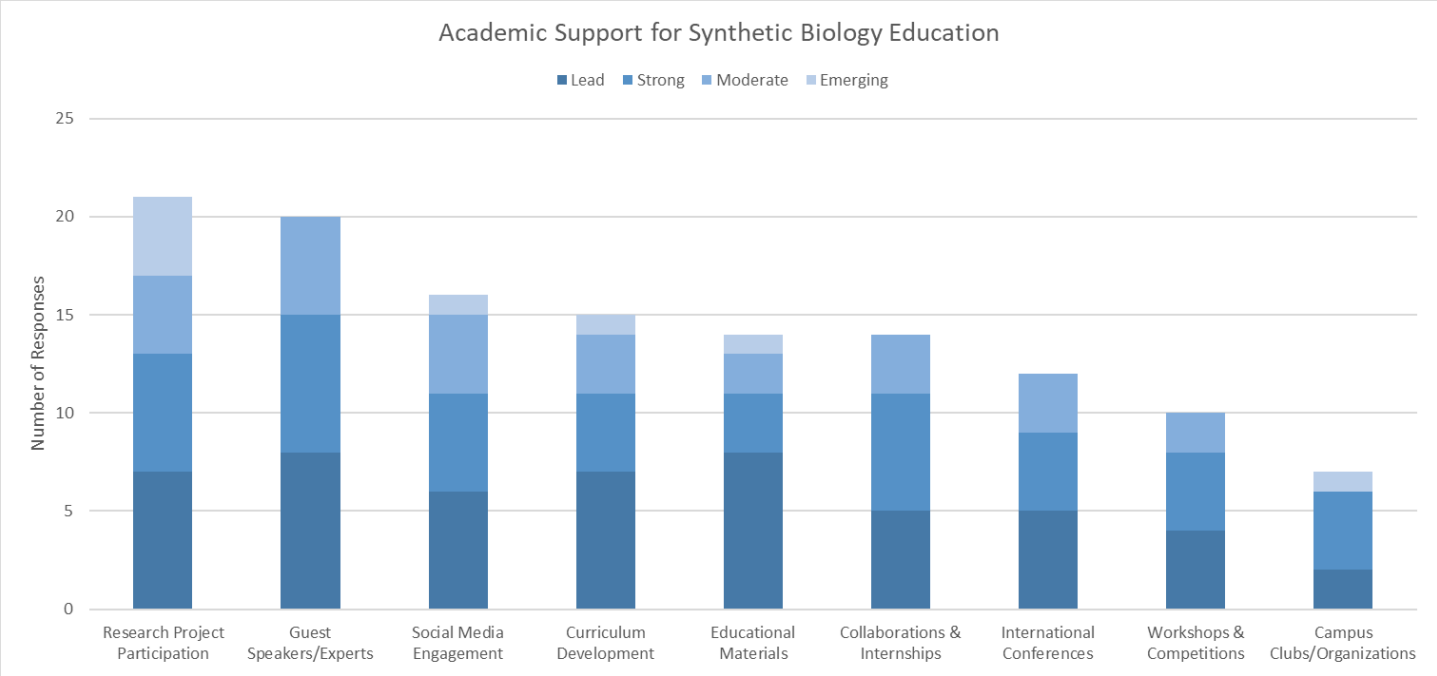

Support for Education in Synthetic Biology

- Research Project Participation: Lead and Strong ecosystems show strong engagement (7 and 6 responses respectively), suggesting active involvement in research projects.
- Guest Speakers/Experts: Both Lead and Strong ecosystems again lead in responses (8 and 7 respectively), indicating frequent expert interactions.
- Social Media Engagement: Responses are fairly distributed, with Lead and Strong ecosystems again showing higher numbers (6 and 5).
- Curriculum Development: Lead ecosystem shows the highest response (7), followed by Strong (4), suggesting a more developed curriculum in these ecosystems.
- Educational Materials: Like curriculum development, Lead (8) and Strong (3) ecosystems show more availability of educational materials.
- Collaborations & Internships: Strong ecosystem has more responses (6), followed by Lead (5), indicating more opportunities for practical learning.
- International Conferences: Responses are moderate across ecosystems, with Lead and Strong having 5 and 4 responses respectively.

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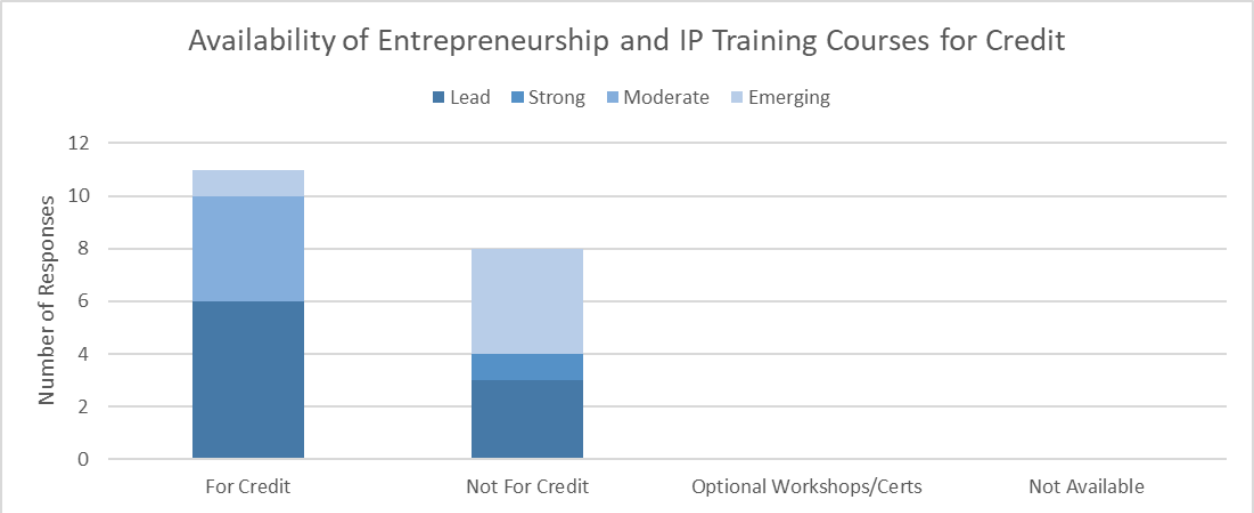
- Workshops & Competitions: Responses are evenly distributed, with a slight lead in the Lead and Strong ecosystems.
- Campus Clubs/Organizations: Moderate responses, with Strong ecosystem showing a slightly higher engagement (4).

5. *Are entrepreneurship training courses, IP training, mentoring, etc. available for students as credited courses, rather than just optional workshops or certificates?*
   a. Yes, for credit
   b. Yes, but not for credit
   c. No, but available as optional workshops or certificates
   d. No, not available at all



Entrepreneurship Training Availability

- For Credit: Lead ecosystem shows the highest response (6), followed by Moderate (4), suggesting more accredited entrepreneurship courses.
- Not For Credit: Emerging ecosystem shows a notable response (4), indicating the availability of non-credited courses.
- Optional Workshops/Certs and Not Available: No responses in these categories across all ecosystems.

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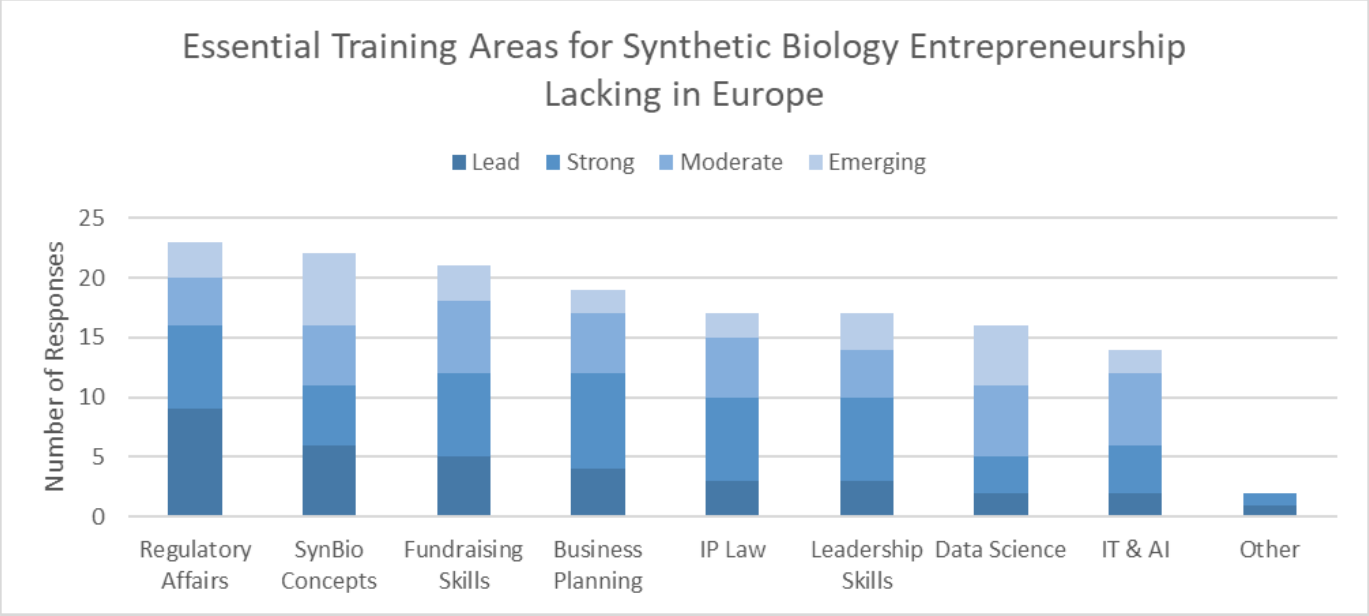
6. *What specific areas of training or education are essential for individuals to succeed in synthetic biology entrepreneurship, but are not currently sufficiently available (lack) in your country? Select all that apply.*
   a. Thorough understanding of synthetic biology concepts.
   b. Data science and statistics.
   c. Regulatory affairs and compliance requirements relating to biosafety, biosecurity, and environmental protection.
   d. Intellectual property (IP) law with basic understanding of patent law, trademarks, and copyrights.
   e. Fundraising skills such as effective pitch creation and communication.
   f. Team building, project management and leadership skills.
   g. IT Skills, Machine learning, Artificial Intelligence (AI)
   h. Business plan, business modelling, manufacturing
   i. Other (please specify)



Essential Training Areas Lacking in Synthetic Biology Entrepreneurship

- Regulatory Affairs: Strong responses from Lead (9) and Strong (7) ecosystems, indicating a perceived lack in this area.

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- SynBio Concepts: Evenly distributed responses, with slightly higher numbers in Lead (6) and Emerging (6) ecosystems.
- Fundraising Skills: Strong ecosystem leads (7), followed by Moderate (6), suggesting a need for better fundraising skills training.
- Business Planning: Strong ecosystem shows the highest response (8), followed by Moderate (5).
- IP Law and Leadership Skills: Both areas show similar responses across ecosystems, with Strong leading in IP Law (7) and equally distributed in Leadership Skills.
- Data Science: Moderate and Emerging ecosystems show higher responses (6 and 5 respectively), indicating a need for training in this area.
- IT & AI: Responses are moderate, with a slight lead in the Strong ecosystem (4).

7. *Which of the below are currently implemented to enhance entrepreneurial skills among students conducting synthetic biology academic research at your institution?*
   a. Offering entrepreneurship courses such as project management, finance, and marketing.
   b. Start-up idea pitch competitions.
   c. Providing mentorship from successful entrepreneurs and networking opportunities.
   d. Encouraging participation in accelerator programs.
   e. Encouraging interdisciplinary collaborations to develop skills in communication, collaboration, and creativity.
   f. Strengthen co-operation between universities and companies.

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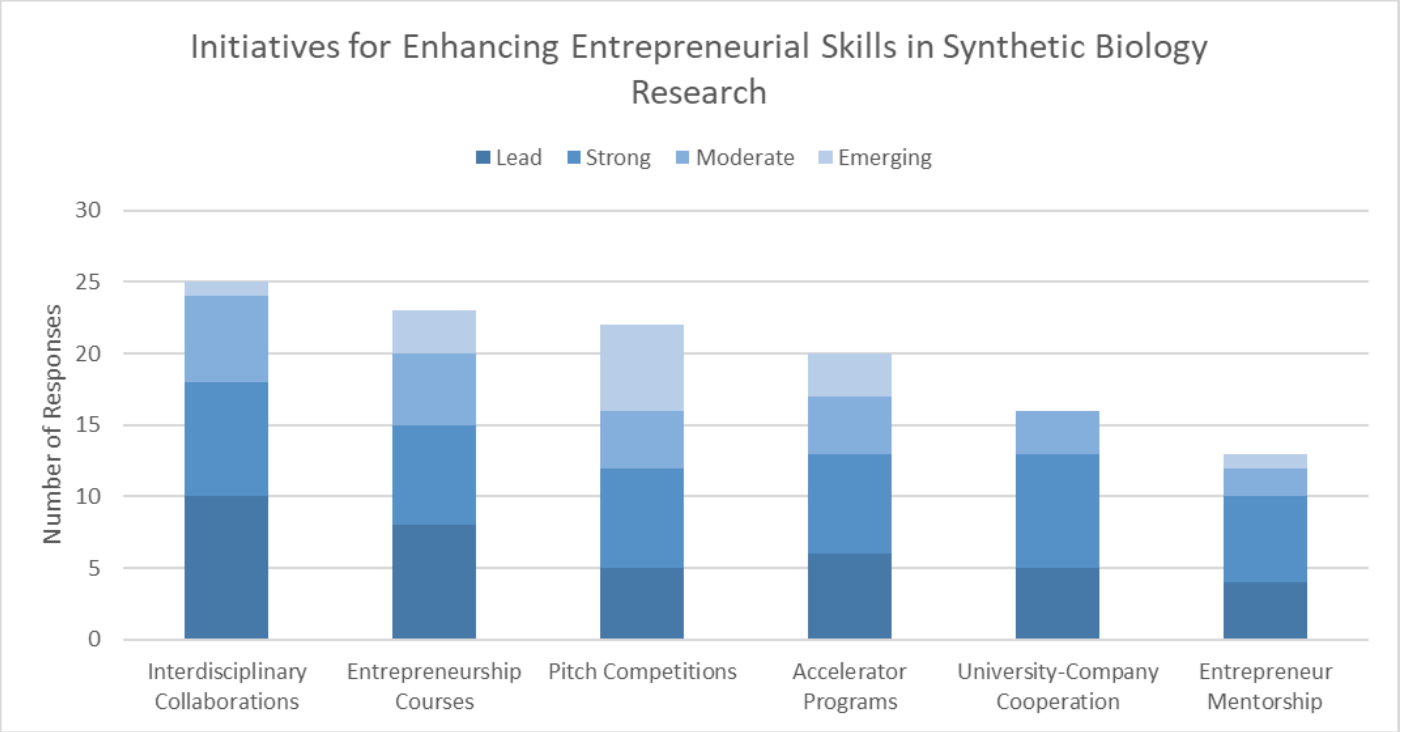

Enhancing Entrepreneurial Skills

- Interdisciplinary Collaborations: Lead ecosystem leads with 10 responses, followed by Strong (8), indicating more collaboration opportunities.
- Entrepreneurship Courses: Again, Lead (8) and Strong (7) ecosystems show more availability of such courses.
- Pitch Competitions: Responses are fairly distributed, with Strong ecosystem showing a slight lead (7).
- Accelerator Programs: Responses are moderate across ecosystems, with Lead and Strong showing a slightly higher number (6 and 7 respectively).
- University-Company Cooperation: Strong ecosystem leads (8), indicating better cooperation with industry.
- Entrepreneur Mentorship: Responses are moderate, with Strong ecosystem showing a slightly higher engagement (6).

8. *In your experience, during which stage does an academic researcher/student require the most assistance to successfully establish their own company? Please select all that apply.*

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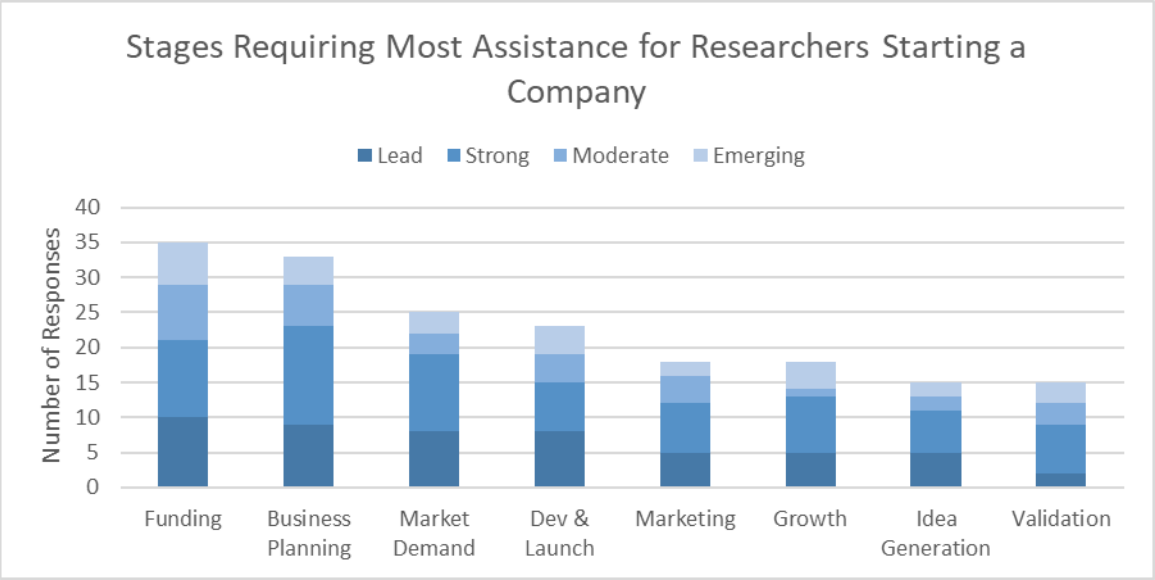
a. Idea generation
b. Funding
c. Business planning
d. Marketing
e. Development and Launch
f. Validation
g. Growth/Scale-up
h. Identifying market demand for the technology.



Assistance Stages for Establishing Companies

- Funding: Strong and Lead ecosystems show high responses (11 and 10 respectively), indicating the need for more funding assistance.
- Business Planning: Strong ecosystem leads with 14 responses, followed by Lead (9), suggesting a need for better business planning support.
- Market Demand and Dev & Launch: Responses are fairly distributed across ecosystems, with Strong leading in Market Demand (11).
- Marketing and Growth: Responses are moderate, with Strong ecosystem showing slightly higher numbers in both categories.
- Idea Generation and Validation: Both categories show moderate responses, with Strong ecosystem having a slightly higher number in Validation (7).

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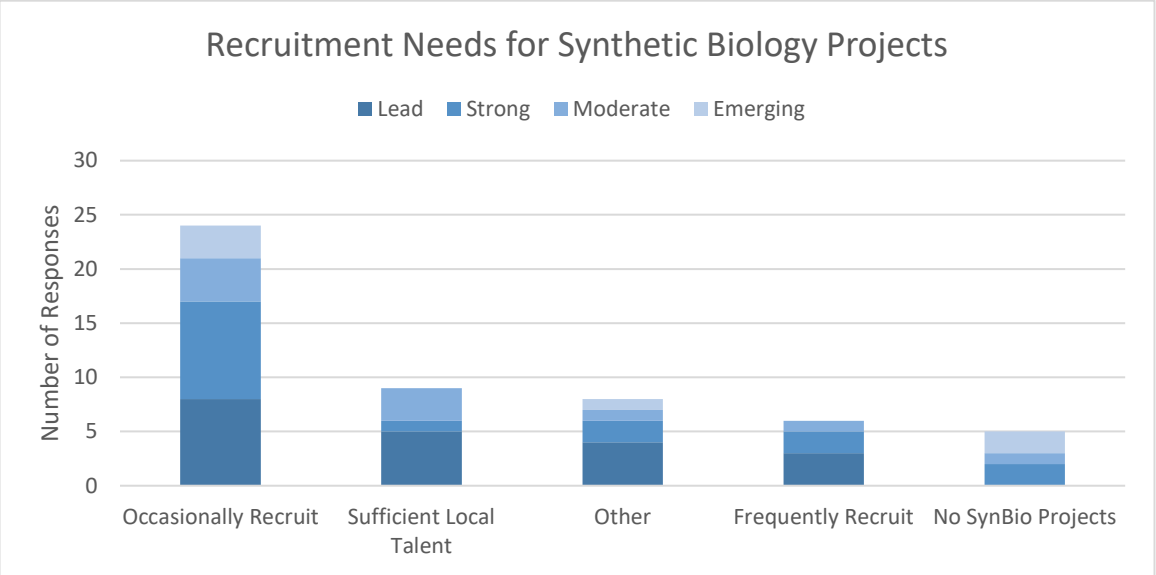
9. *Do you often find the need to recruit students from other countries, such as post-docs and PhD candidates, for synthetic biology projects due to a shortage of local talent?*
   a. *Yes, frequently (Please specify where)*
   b. *Yes, occasionally.*
   c. *No, we have sufficient local talent.*
   d. *Not applicable, we do not have synthetic biology projects.*
   e. *Other (Please specify)*



Recruitment of International Talent for Synthetic Biology Projects

- Occasionally Recruit: The Lead ecosystem shows the highest response (8), followed by Strong (9). Moderate and emerging also show some recruitment (4 and 3).
- Sufficient Local Talent: Mainly seen in the Lead ecosystem (5 responses), suggesting a better local talent pool.
- Other: Responses are moderate across ecosystems, with Lead and Strong showing some varied responses (4 and 2).
- Frequently Recruit: Responses are low across all ecosystems, with Lead and Strong having a slightly higher count (3 and 2).

10. *How do you attract talent for synthetic biology-related job profiles? Please select all that apply:*

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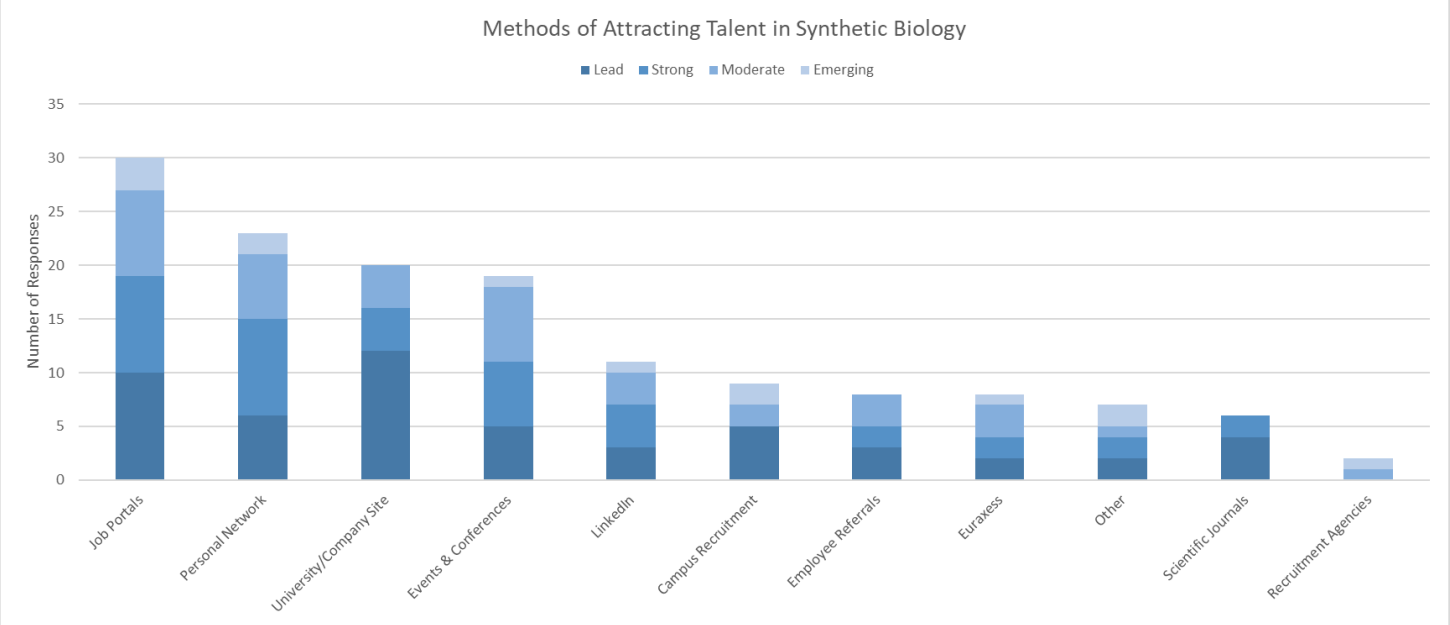
a. Through job postings on online job portals
b. Through recruitment agencies
c. Through referrals from current employees
d. Through networking events and conferences
e. Through campus recruitments
f. Through Euraxess job platform
g. Through personal network
h. Through job advertisements in Nature, Science, or other scientific journals
i. Through LinkedIn
j. Through university/company website
k. Other (please specify)



Attracting Talent for Synthetic Biology-Related Job Profiles

- Job Portals: Lead and Strong ecosystems lead in using this method (10 and 9 responses respectively).
- Personal Network: Responses are fairly distributed, with Strong showing a slightly higher count (9).
- University/Company Site: Lead ecosystem shows the highest response (12), suggesting effective use of institutional resources for recruitment.
- Events & Conferences and LinkedIn: Moderate responses across ecosystems, with Strong showing a slightly higher engagement in Events & Conferences.

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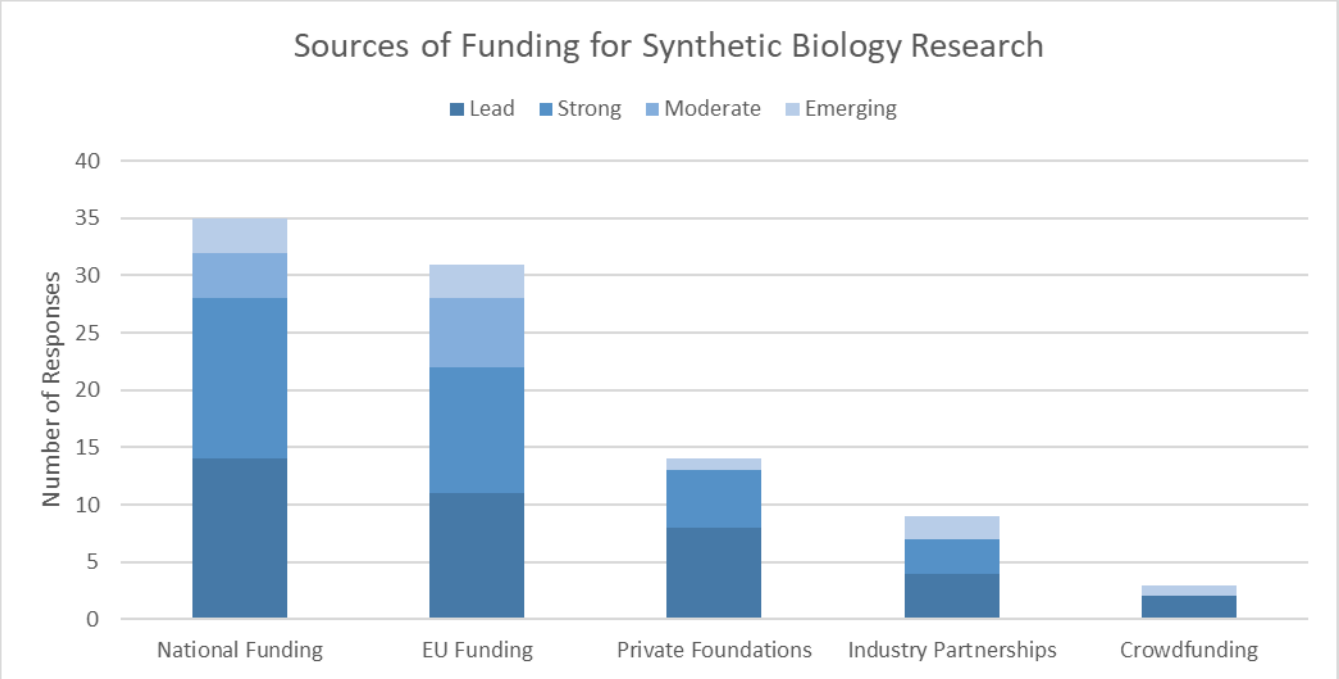
- Campus Recruitment and Employee Referrals: Responses are low, with some engagement in the Lead and Strong ecosystems.
- Euraxess, Other, Scientific Journals, Recruitment Agencies: Responses are low across all ecosystems.

11. *What sources of funding for synthetic biology research are available in your country?*
a. National funding agencies, please specify:
b. European Union funding, please specify:
c. Private foundations, please specify:
d. Industry partnerships where companies provide funding and expertise in exchange for access to the resulting technologies. Please specify:
e. Crowdfunding please specify:



Sources of Funding for Synthetic Biology Research

- National Funding: Strong responses in Lead and Strong ecosystems (14 each), indicating better access to national funds.
- EU Funding: Responses are evenly distributed across Lead and Strong ecosystems (11 each).

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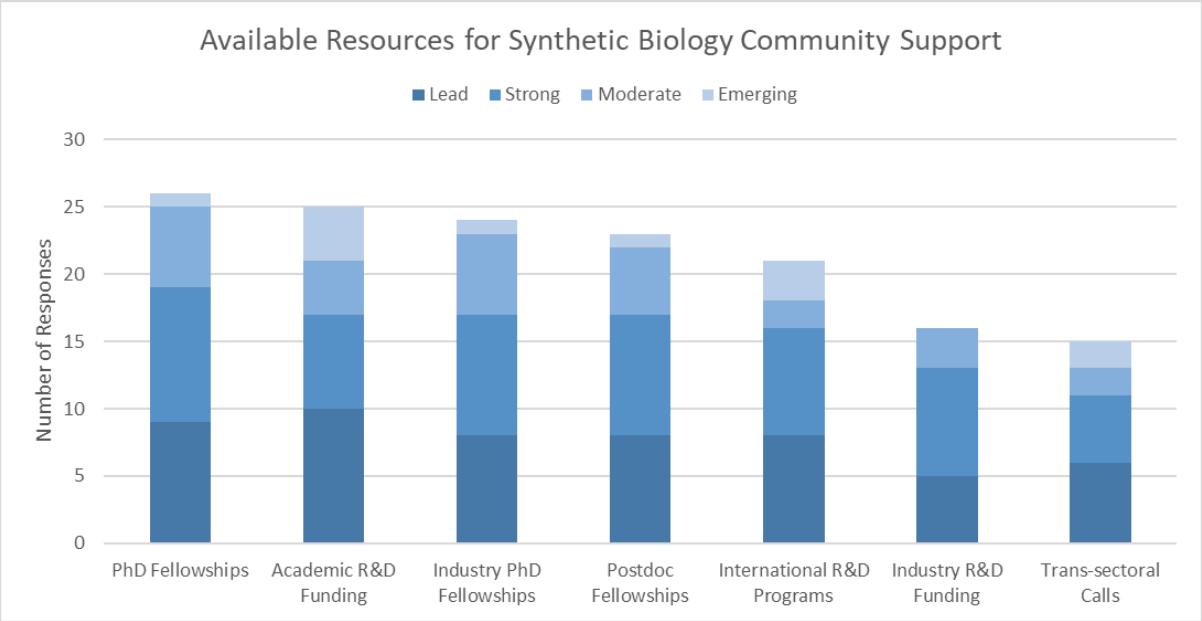
- Private Foundations: Lead ecosystem shows a notable number of responses (8), followed by Strong (5).
- Industry Partnerships and Crowdfunding: Responses are low, indicating less reliance on these sources.

12. *What types of resources are available in your country to support the synthetic biology community? Please select all that apply.*
    a. National PhD fellowships
    b. National PhD fellowships in collaboration with industry
    c. National postdoc fellowships
    d. National R&D project funding for academia
    e. National R&D project funding for industry (SMEs)
    f. National collaborative trans-sectoral calls for proposals between academia and industry
    g. International collaborative R&D funding programs



Resources Available to Support the Synthetic Biology Community

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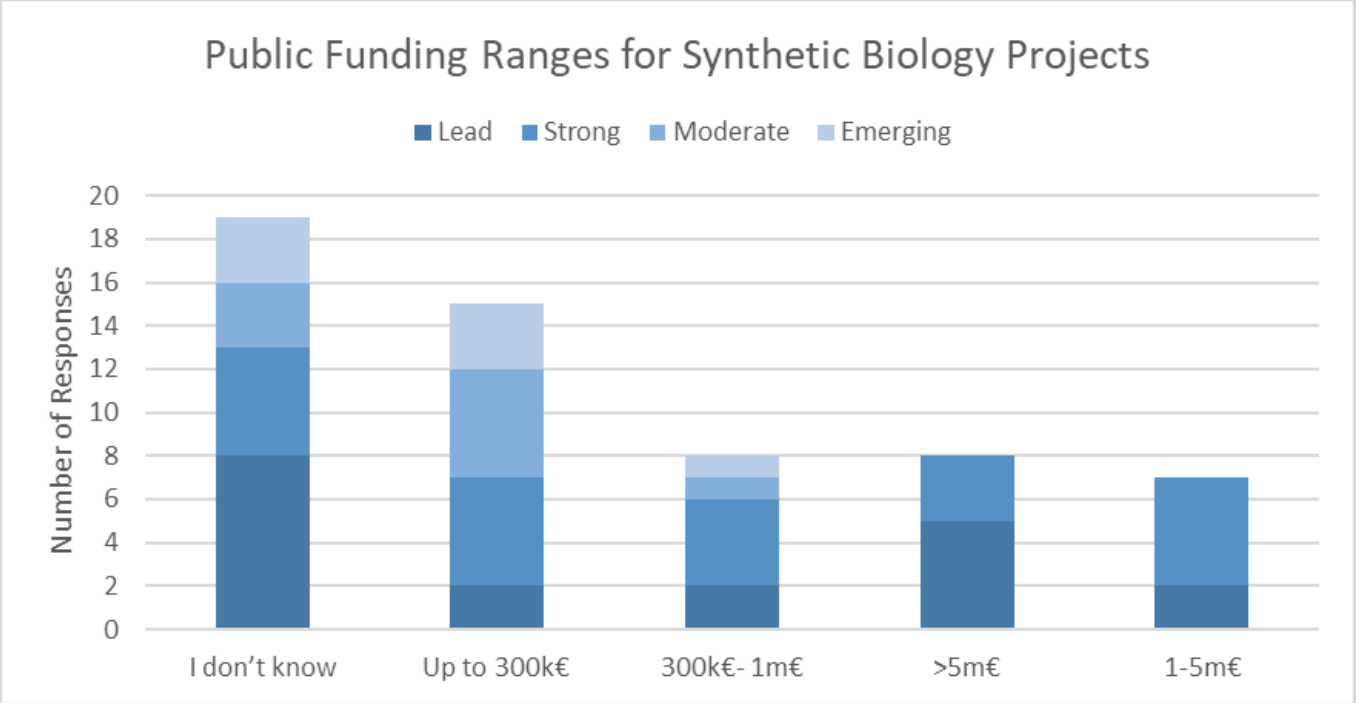
- PhD and Academic R&D Funding: Lead and Strong ecosystems show strong responses, indicating better funding opportunities.
- Industry PhD Fellowships and Postdoc Fellowships: Again, Lead and Strong ecosystems lead, showing better support for advanced studies.
- International R&D Programs: Fairly distributed responses, with Lead and Strong ecosystems showing a higher count.
- Industry R&D Funding and Trans-sectoral Calls: Responses are moderate, with Lead and Strong ecosystems showing slightly higher engagement.

13. *Please select a range of available public funding for synthetic biology projects in your country or generalist funding that can be used for synthetic biology projects.*
    a. Up to 300k€
    b. 300k€- 1m€
    c. 1-5m€
    d. >5m€
    e.I don't know.



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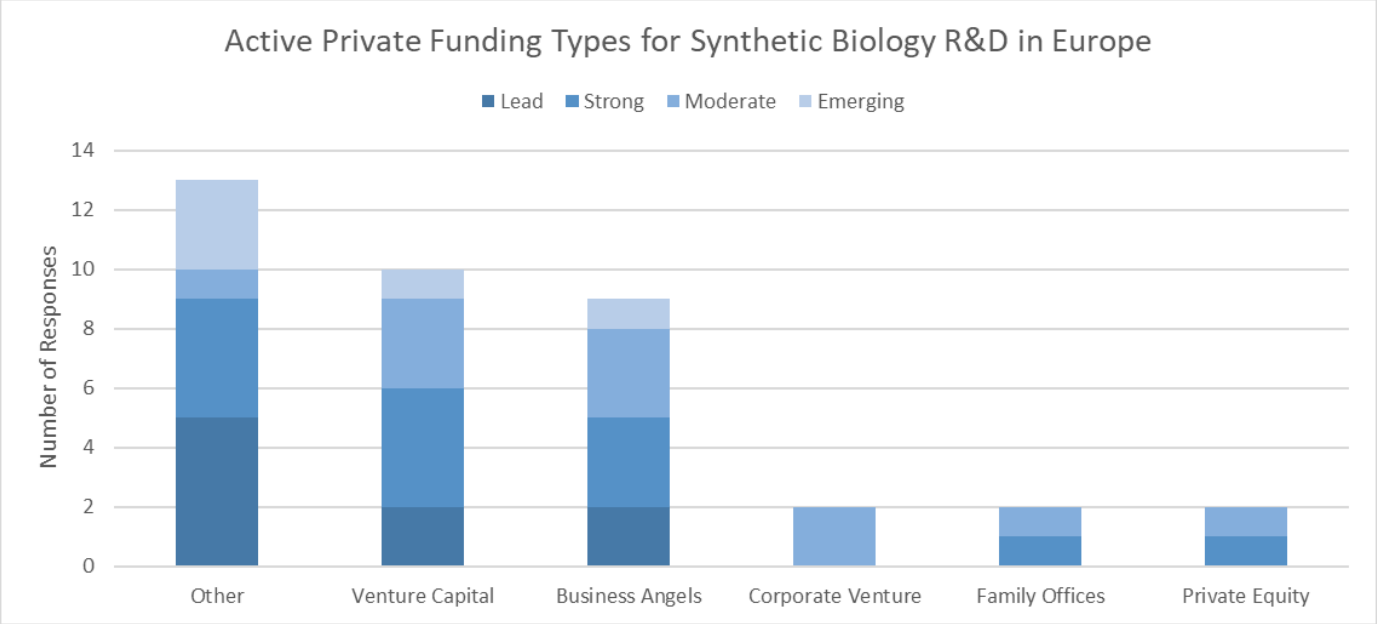
Public Funding for Synthetic Biology Projects

- I don't know: The most common response in all ecosystems, indicating a lack of clarity regarding funding amounts.
- Up to 300k€ and 300k€- 1m€: Responses are moderate, with a slight lead in the Strong ecosystem.
- >5m€ and 1-5m€: Responses are lower, with Lead ecosystem showing a slightly higher engagement in higher funding categories.

14. *Which of the following types of private funding is currently most active in your country to support synthetic biology research and development? Please select all that apply.*
    a. Business angels
    b. Venture capital (VC)
    c. corporate venture capital (CVC)
    d. Family offices
    e. Private equity
    f. Other (please specify)



Types of Private Funding for Synthetic Biology R&D

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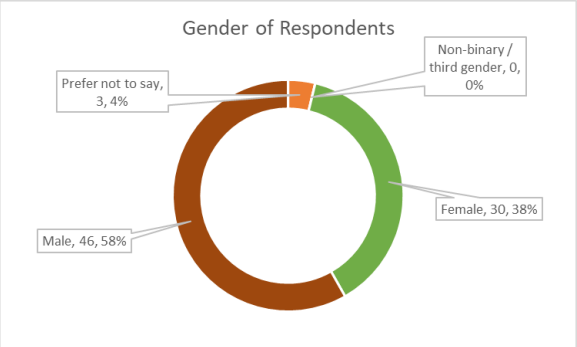
- Other: The most common response in the Lead ecosystem (5), indicating diverse funding sources.
- Venture Capital: Responses are evenly distributed, with a slight lead in the Strong ecosystem (4).
- Business Angels: Responses are moderate across ecosystems.
- Corporate Venture, Family Offices, Private Equity: Very low responses, suggesting less reliance on these funding types.

6.1.1.6 General Questions for all Stakeholder Groups

- **Demographics**

1. *Gender of Respondents*



2. *Countries & Eco-systems of Respondents*

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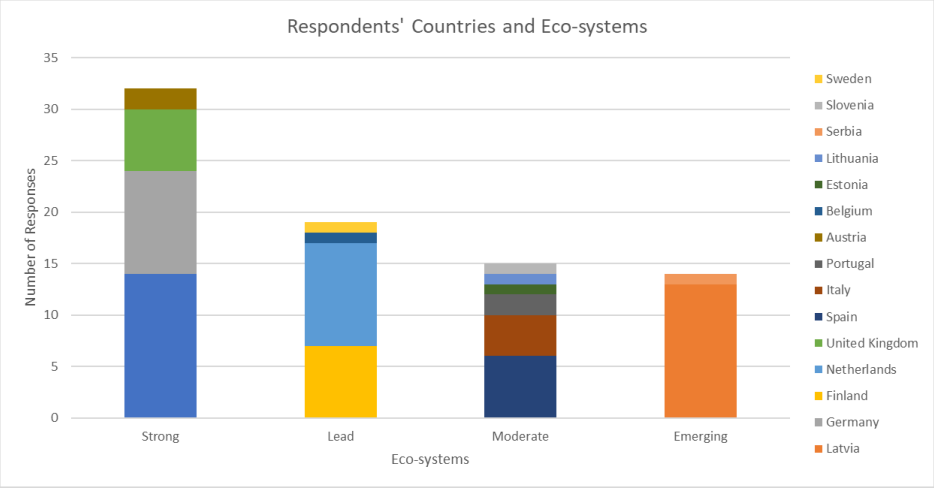

3. Name of the workplace

4. Role of the respondents

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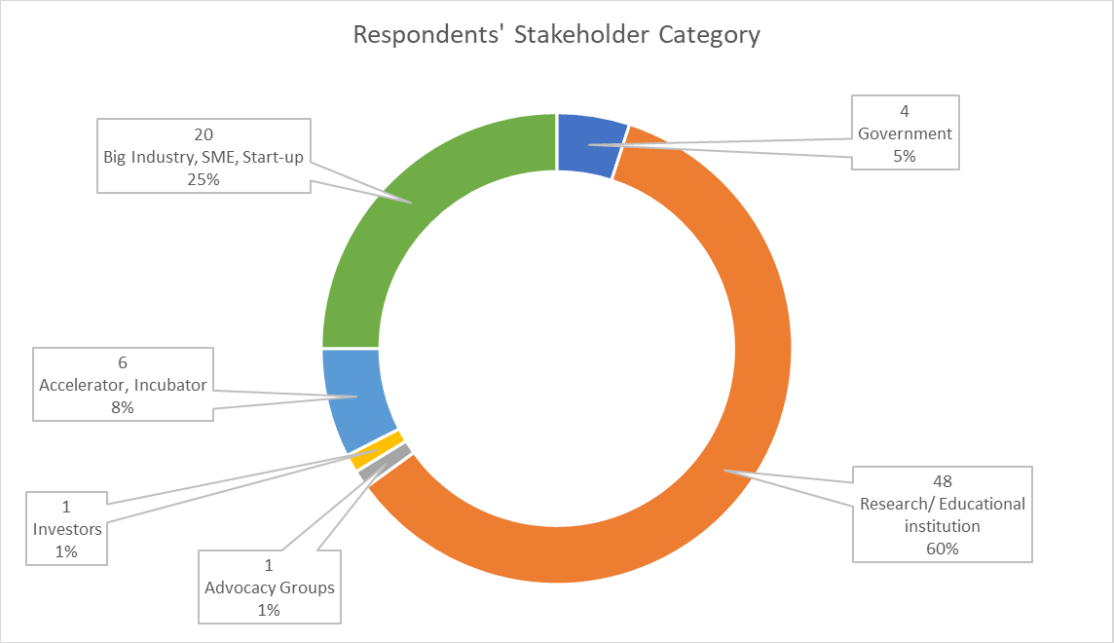

Questions

1. *How do you see the future of the below domains of synthetic biology in Europe in the next 5-10 years? Please provide your opinion on each of the below.*
   a. *Human health and performance (e.g., anti-malaria treatment, synthetic DNA for gene therapy)*
   b. *Agriculture and food (e.g., Lab-grown meat)*
   c. *Consumer products and services (e.g., direct-to-consumer-consumer genetic testing based on microbiome)*
   d. *Materials and energy production (e.g., bioplastics, microalgae for biofuel)*

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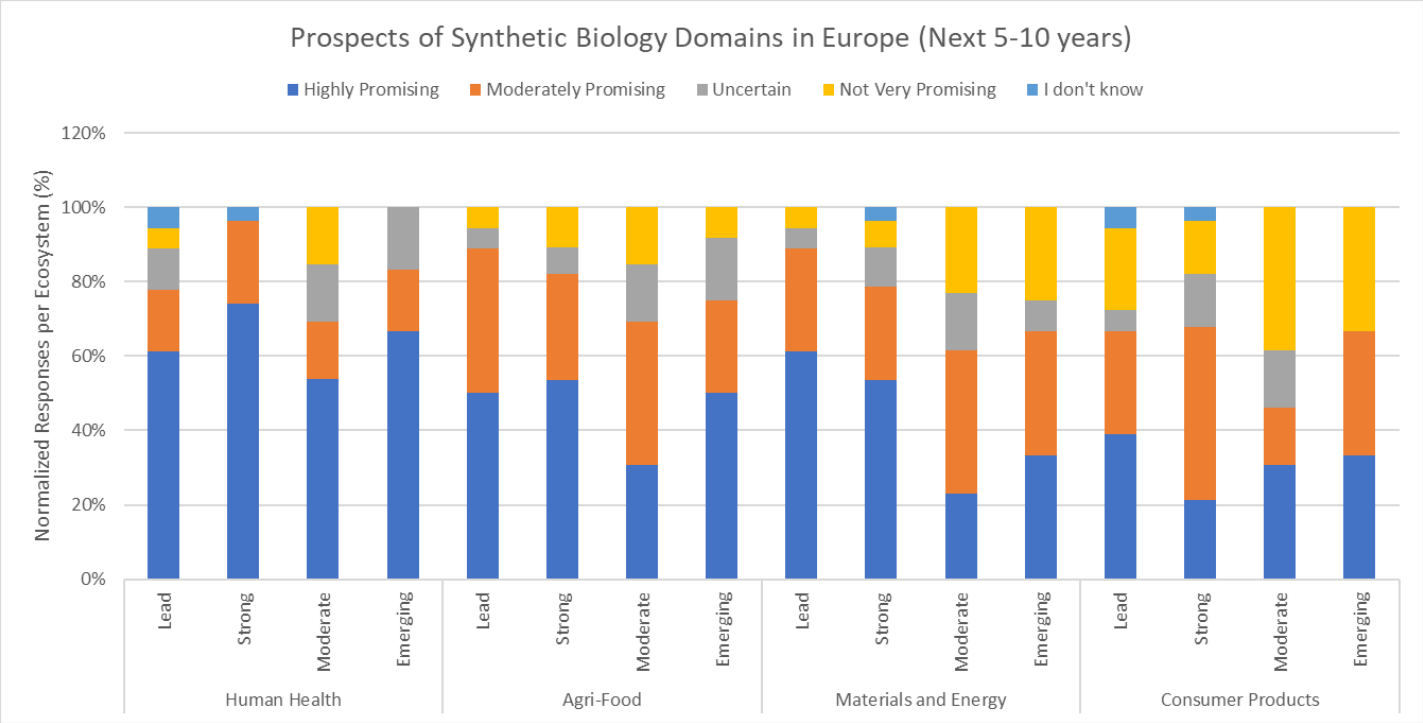

Future of Synthetic Biology Domains in Europe:

- Human Health: High optimism in all ecosystems, especially in Strong (74%) and Lead (61%).
- Agriculture and Food: Mixed views with Lead (50% highly promising) and Moderate (38% moderately promising) ecosystems showing varied optimism.
- Materials and Energy: Strong potential seen in Lead (61% highly promising) and Strong (54%) ecosystems.
- Consumer Products: Varied opinions with Lead (39% highly promising) and Moderate (31%) showing cautious optimism.

2. *Are policy makers in your country well-aware of the potential benefits of synthetic biology to maximize innovation in your country?*

a. *Yes, I have constant support from my country's policy makers. Eg: Meet them in conferences, have special schemes and grants available specifically for synthetic biology field.*
b. *Partially, I still have to explain the potential benefits of the field to get their engagement.*
c. *No, the policy makers are unaware of the benefits from synthetic biology research.*
d. *I don't know.*

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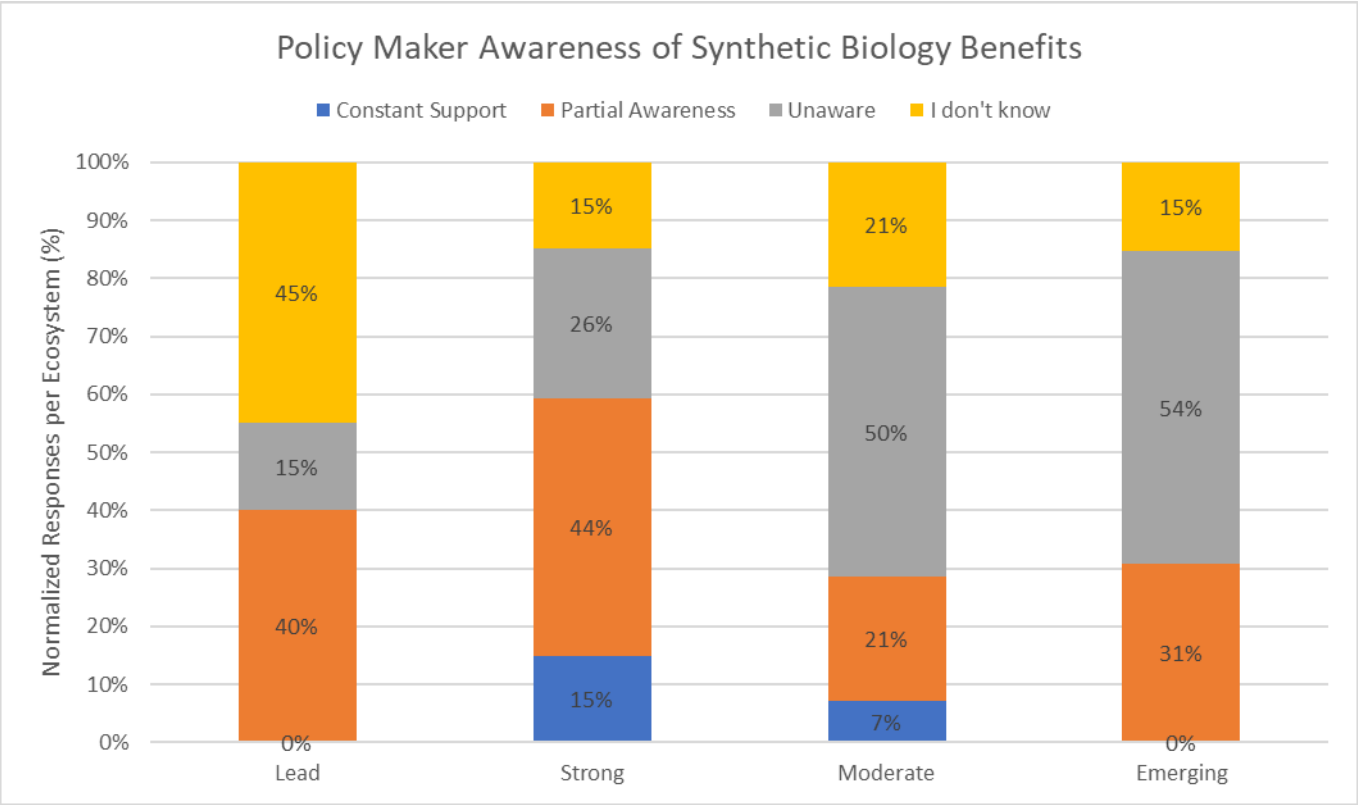

Awareness of Synthetic Biology Benefits by Policymakers:

- Lead Ecosystem: High uncertainty (45% don't know), some partial awareness (40%).
- Strong Ecosystem: Predominant partial awareness (44%), some constant support (15%).
- Moderate Ecosystem: Major unawareness (50%), some partial awareness (21%).
- Emerging Ecosystem: Significant unawareness (54%), partial awareness (31%).

3. *Which of the below is currently lacking in your country to inform and engage the general public regarding synthetic biology innovation? Please select up to 4 most important choices.*

a. *Public events, such as workshops and lectures by experts for general audience.*
b. *Information by (social) media.*
c. *Use of educational materials, such as videos, documentaries, and brochures, to explain synthetic biology in simple terms.*
d. *Synthetic Biology integration into school and university curriculum. Eg: Workshops for school kids by synthetic biology community.*

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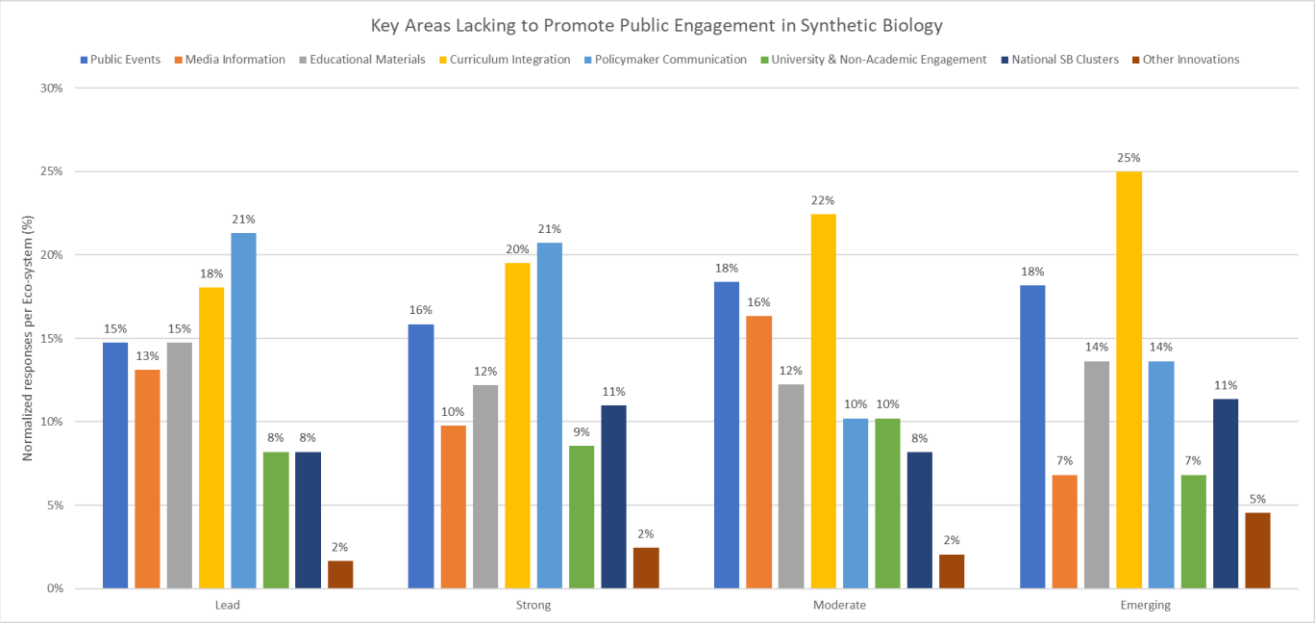
e. *Policymakers and regulators inform the public about the potential benefits of synthetic biology innovation.*
f. *Universities engaging with non-academic organisations to promote students' participation in synthetic biology events such as iGEM competition.*
g. *Setting up synthetic biology clusters at national level.*
h. *Other ideas to promote synthetic biology innovation but is currently lacking in your country, please specify below:*



Lack of Engagement in Synthetic Biology Innovation:

- Commonly perceived gaps include public events, media information, and educational materials.
- Curriculum integration and policymaker communication are notable areas of need.

4. *To what extent do you believe the current government regulations hinder innovation in synthetic biology in the following areas in your country?*
   a. *Funding opportunities*
   b. *Licensing processes*
   c. *Intellectual property protection*
   d. *Import and export restrictions.*
   e. *Compliance costs*
   f. *Other, please specify:*

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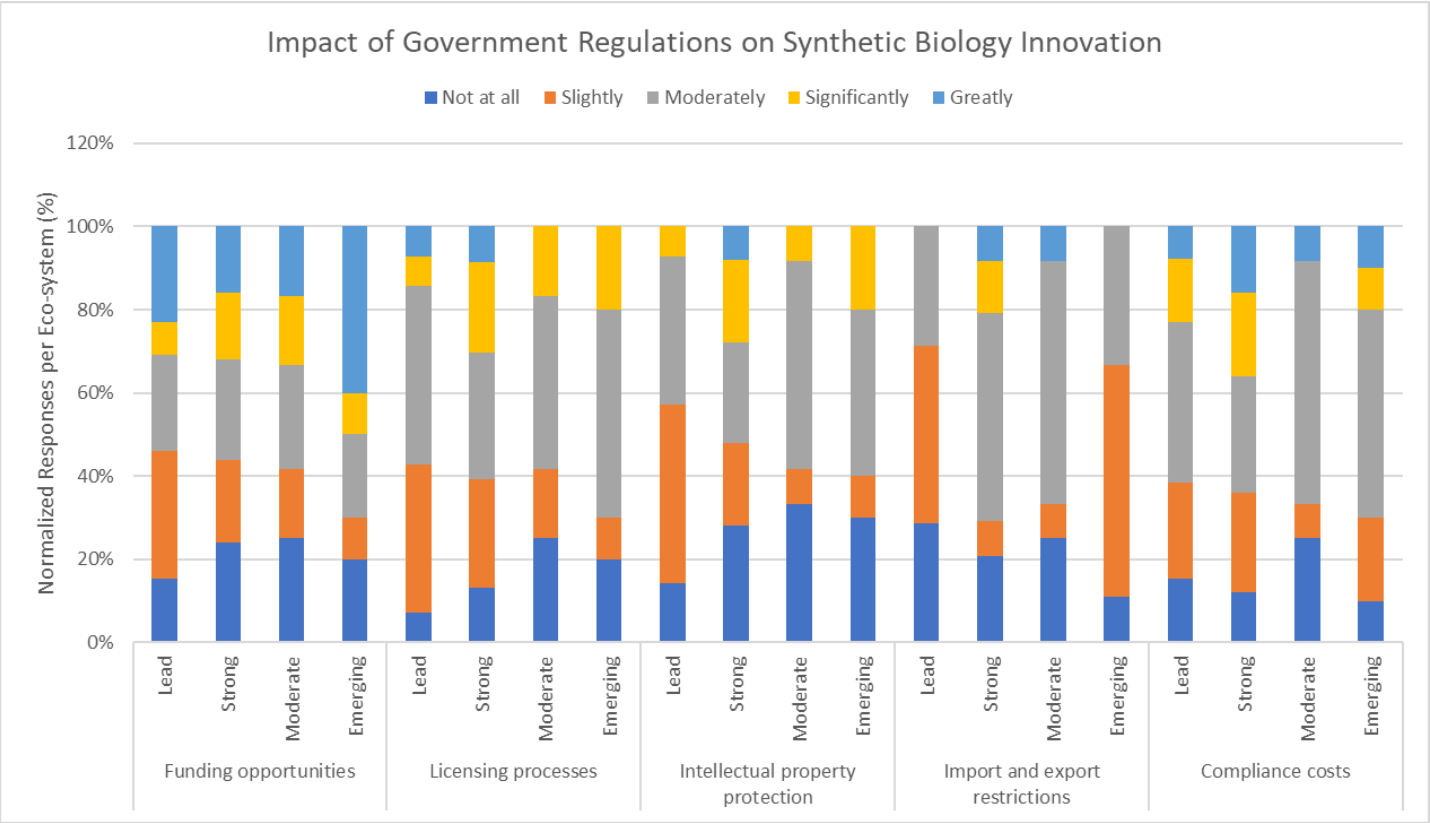

- **Funding Opportunities:**
  Varied views: Lead (15% no hindrance, 23% significant hindrance), Strong (evenly split), Moderate (equal lean towards "Not at all" and "Moderately"), Emerging (40% significant hindrance).
- **Licensing Processes:**
  Lead and Moderate majorly perceive moderate hindrance; Strong leans towards significant hindrance; Emerging sees moderate to significant hindrance.
- **Intellectual Property Protection:**
  Generally perceived as a moderate hindrance across ecosystems, with Lead also noting slight hindrance.
- **Import and Export Restrictions:**
  Lead and emerging perceive low hindrance, while Strong and Moderate see moderate to significant hindrance.

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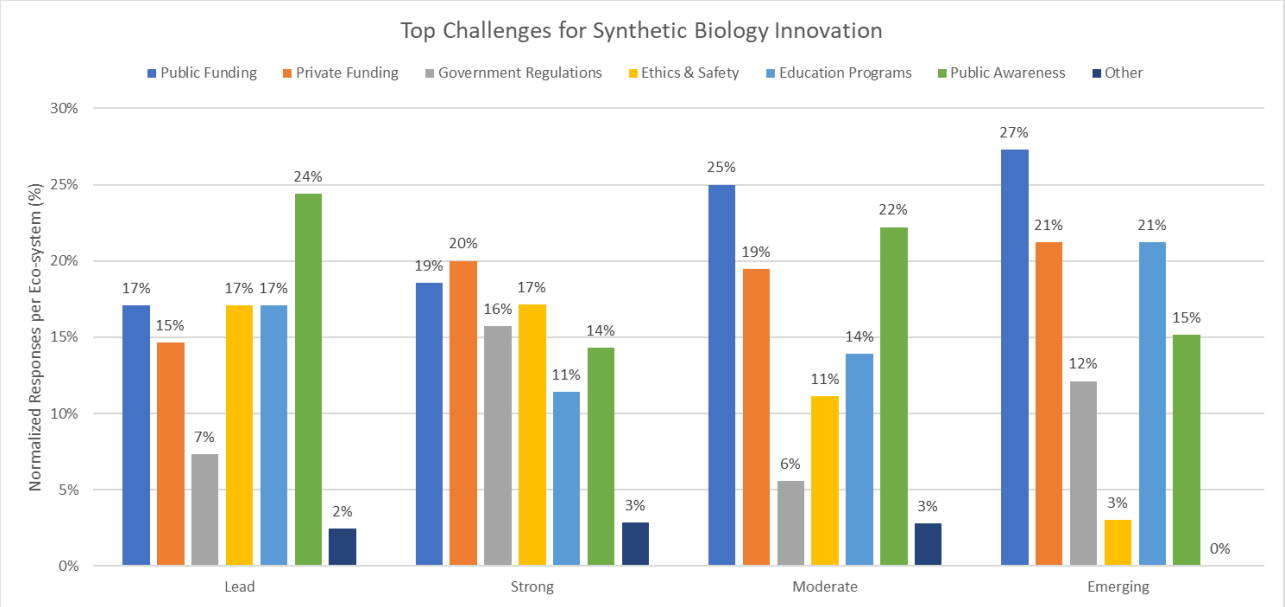
- **Compliance Costs:**
  Moderate to significant hindrance noted across ecosystems, particularly in Moderate and Emerging.
- **Other Factors:**
  Emerging mentions "GMO Lab rating" and lack of political support; Lead cites lack of coherent EU research agenda; Moderate notes "GMO Legislation" and issues like corruption.

5. *In your opinion, what are the biggest challenges facing synthetic biology innovation in your country? Please select your top 3 from below:*

a. *Lack of public funding (grants, tax incentives).*
b. *Lack of private funding opportunities (Venture Capital, Private equity).*
c. *Government regulations creating barriers to enter the market.*
d. *Ethics and safety concerns*
e. *Lack of dedicated educational programs in synthetic biology*
f. *Lack of public awareness*
g. *Other (please specify)*



Lead Ecosystem:

- Major challenge: Lack of public awareness (24%).

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- Other significant challenges: Lack of public funding, ethics and safety concerns, and lack of educational programs (17% each).
- Lesser challenges: Lack of private funding (15%) and government regulations (7%).

Strong Ecosystem:

- Top challenge: Lack of private funding opportunities (20%).
- Close second: Lack of public funding (19%).
- Other notable challenges: Government regulations (17%) and ethics/safety concerns (16%).

Moderate Ecosystem:

- Primary challenge: Lack of public funding (25%).
- Next significant challenge: Lack of private funding (19%).
- Other concerns: Lack of public awareness (22%) and less so for government regulations (6%) and ethics/safety (11%).

Emerging Ecosystem:

- Main challenges: Lack of public funding and private funding opportunities (27% and 21% respectively).
- Other key challenge: Lack of dedicated educational programs (21%).

Overall, across ecosystems, the most common challenges are lack of public funding, private funding opportunities, and public awareness. Government regulations and ethics/safety concerns are also recognized as significant hurdles, but to a lesser extent.

6. *Which institutions provide funding for synthetic biology projects in your country? Please select all that apply.*

a. *National government agencies*
b. *Regional government agencies*
c. *Non-governmental organizations (NGOs)*
d. *Private foundations*
e. *Corporations/Companies*
f. *European Commission (EC)*

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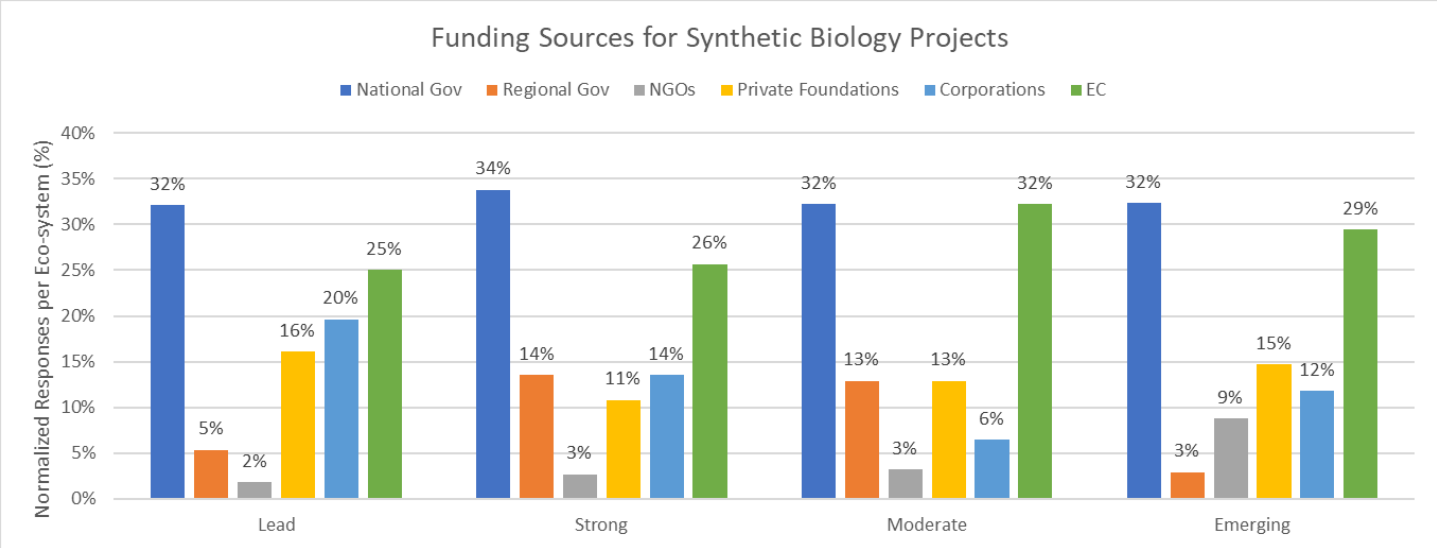

Lead Ecosystem:

- Primary source: National government agencies (32%).
- Significant contributions from the European Commission (25%) and private foundations (16%).
- Lesser roles of regional government agencies (5%) and NGOs (2%).

Strong Ecosystem:

- Major funding from national government agencies (34%) and the European Commission (26%).
- Notable support from regional government agencies (14%) and private foundations (11%).
- Corporations and NGOs play smaller roles (14% and 3%, respectively).

Moderate Ecosystem:

- Balanced distribution between the European Commission and national government agencies (32% each).
- Equal contributions from regional government agencies and private foundations (13% each).
- Corporations (6%) and NGOs (3%) are less prominent.

Emerging Ecosystem:

- Main funders: National government agencies (32%) and the European Commission (29%).
- Private foundations (15%), corporations (12%), and NGOs (9%) also contribute.

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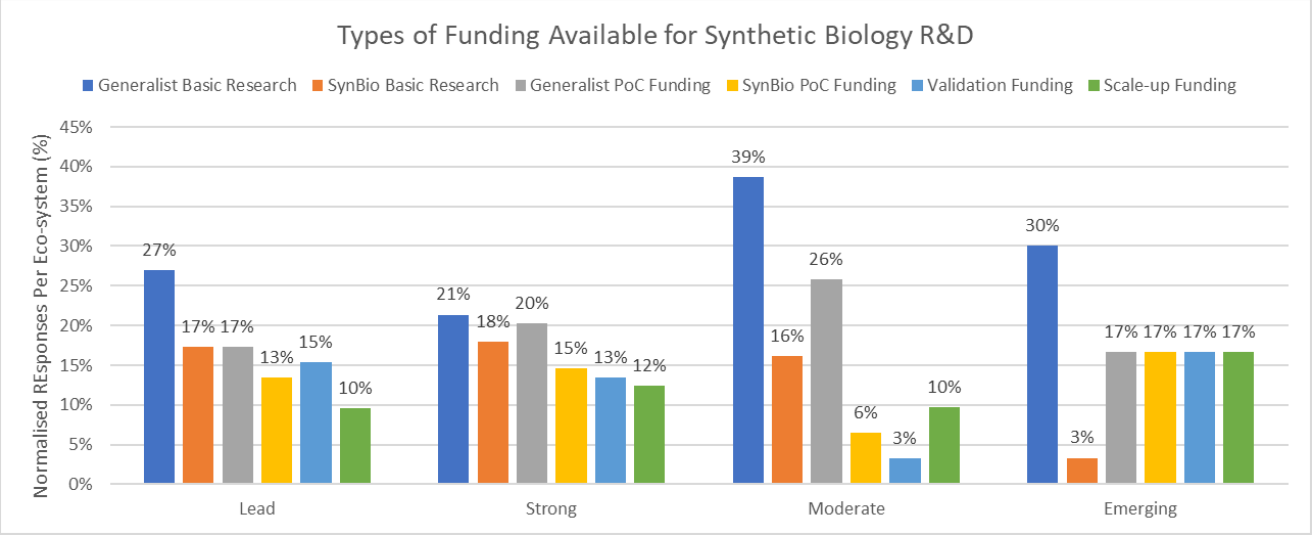
- Least common source: Regional government agencies (3%).

National government agencies and the European Commission are the most significant funding sources in all ecosystems. Regional government agencies, private foundations, and corporations contribute variably across ecosystems. NGOs are generally the least impactful funding source.

7. *Which of the following types of funding is currently available in your country to support synthetic biology research and development? Please select all that apply.*

a. *Generalist/bottom-up basic research funding (i.e., funding for basic research in a range of scientific fields)*
b. *Synthetic biology-targeted basic research funding (i.e., funding specifically for basic research in the field of synthetic biology)*
c. *Proof of concept generalist funding (i.e., funding to test the feasibility of a new idea or technology in a range of scientific fields)*
d. *Proof of concept synthetic biology-targeted funding (i.e., funding to test the feasibility of a new idea or technology specifically in the field of synthetic biology)*
e. *Validation funding (i.e., funding to support the validation and testing of a new product or technology, either in the field of synthetic biology or in a range of scientific fields)*
f. *Scale-up funding (i.e., funding to support the scaling-up and commercialization of a product or technology, either in the field of synthetic biology or in a range of scientific fields).*



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Lead Ecosystem:

- Predominant funding: Generalist/basic research (27%).
- Equal emphasis on synthetic biology-targeted basic research and generalist PoC (17% each).
- Lower for synthetic biology targeted PoC and validation funding (13% and 15%).
- Least for scale-up funding (10%).

Strong Ecosystem:

- Balanced distribution: Generalist/basic research most common (21%).
- Similar levels for synthetic biology-targeted basic research and generalist PoC (18% and 20%).
- Comparable frequencies for synthetic biology-targeted PoC, validation, and scale-up funding (15%, 13%, 12%).

Moderate Ecosystem:

- High prevalence of generalist/basic research funding (39%).
- Significant generalist PoC funding (26%).
- Moderate for synthetic biology-specific basic research (16%); lower for synthetic biology-targeted PoC (6%).
- Least for validation and scale-up funding (3% and 10%).

Emerging Ecosystem:

- Even distribution: Generalist/basic research, synthetic biology-targeted PoC, validation, scale-up funding all at 17%.
- Lower for synthetic biology-targeted basic research (3%).

Generalist/basic research funding most reported across ecosystems (27%). Following in prevalence: Synthetic biology-targeted basic research, generalist PoC, synthetic biology-targeted PoC, validation, and scale-up funding.

8. *In your view, which stage of synthetic biology research is the most difficult to fund in your country? Please select the option that best represents your view.*

a. *Basic science research*
b. *Applied early-stage research.*
c. *Proof of concept (PoC)*
d. *Validation*
e. *Growth or scale-up*
f. *Internationalisation*

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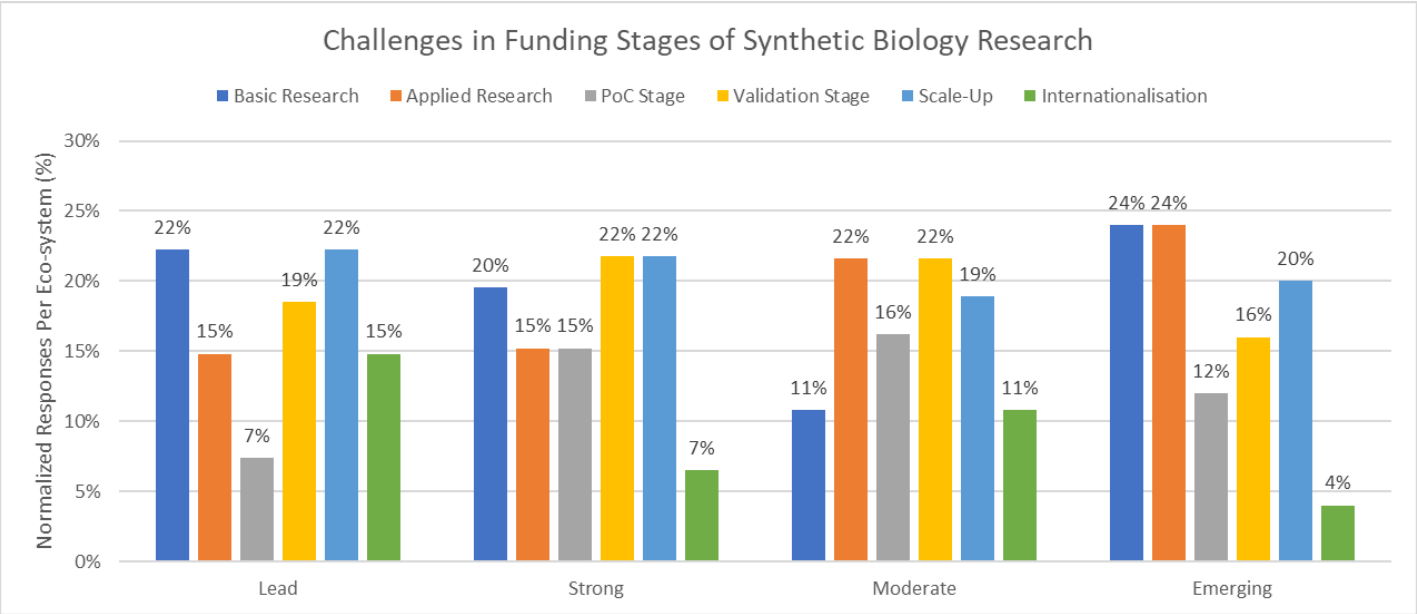

Lead Ecosystem:

- Equal difficulty in funding Basic Science Research and Growth or Scale-up (22% each).
- Significant portion finds Validation Stage challenging (19%).
- Least challenging: Proof of Concept (PoC) Stage (7%).

Strong Ecosystem:

- Validation Stage and Growth or Scale-up perceived as most challenging (22% each).
- Applied Early-Stage Research, PoC, and Basic Science Research receive similar responses (around 15-20%).
- Least challenging: Internationalisation (7%).

Moderate Ecosystem:

- Validation Stage and Applied Early-Stage Research seen as most difficult (22% each).
- Close follow-up by PoC Stage and Growth or Scale-up (16% and 19%).
- Least difficulty in funding Basic Science Research and Internationalisation (11% each).

Emerging Ecosystem:

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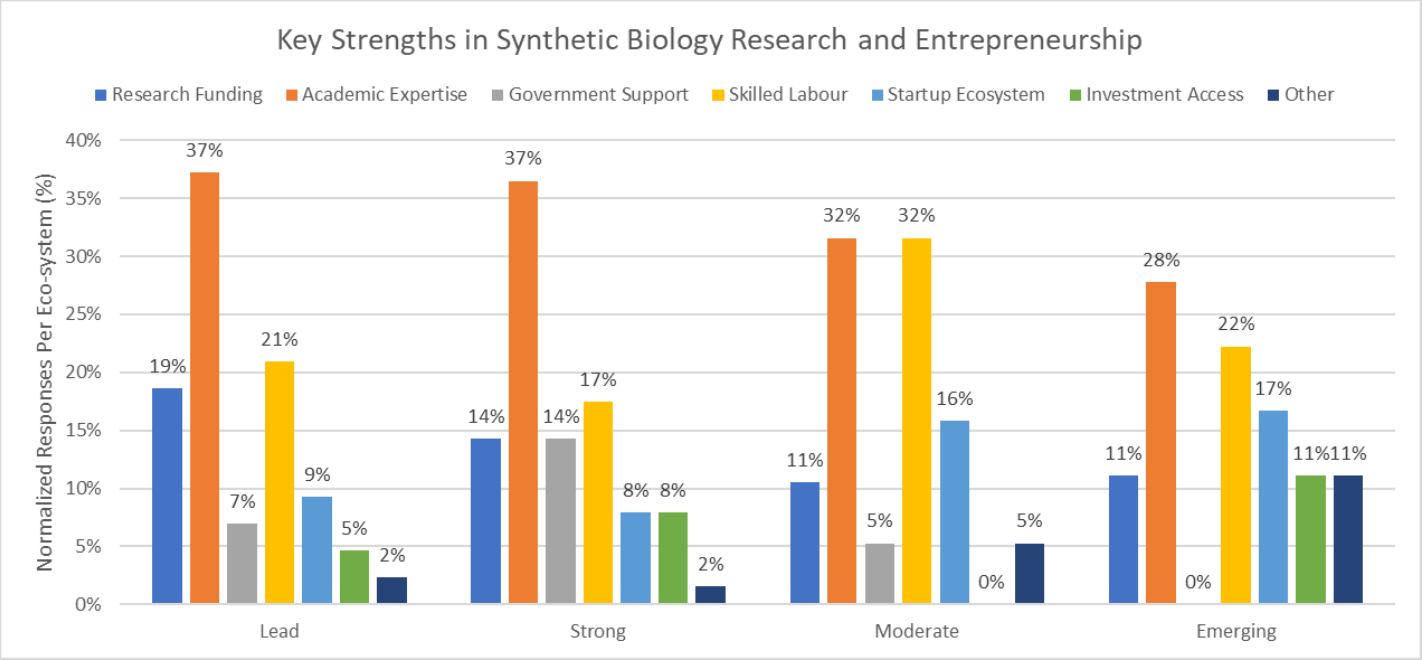
- Basic Science Research and Applied Early-Stage Research identified as most challenging (24% each).
- Growth or Scale-up and Validation also seen as challenging (20% and 16%).
- Least challenging: Internationalisation (4%).

Consistently challenging stages across ecosystems: Basic Science Research, Applied Early-Stage Research, and Growth or Scale-up. Validation Stage notably challenging in Strong and Moderate ecosystems. Proof of Concept (PoC) and Internationalisation generally perceived as less challenging.

9. *In your opinion, what are the key strengths of synthetic biology research and entrepreneurship in your country? Please select all that apply:*

a. *Well-funded research initiatives*
b. *Strong academic institutions with expertise in synthetic biology*
c. *Supportive government policies and funding*
d. *Availability of skilled labour force*
e. *Vibrant startup ecosystem*
f. *Access to investment capital*
g. *Other (please specify)*



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Lead Ecosystem:

- Most significant strength: Academic Expertise (37%).
- Other strengths: Skilled Labour Force (21%) and Well-funded Research Initiatives (19%).
- Lesser emphasis on Government Support (7%) and Startup Ecosystem (9%).

Strong Ecosystem:

- Key strengths: Academic Expertise (37%) and Research Funding (14%).
- Notable strengths: Skilled Labour Force (17%) and Government Support (14%).

Moderate Ecosystem:

- Primary strengths: Skilled Labour Force and Academic Expertise (32% each).
- Significant emphasis on Startup Ecosystem (16%).
- Lesser focus on Government Support (5%).

Emerging Ecosystem:

- Main strengths: Academic Expertise (28%) and Skilled Labour Force (22%).
- Notable strengths: Startup Ecosystem (17%) and Access to Investment Capital (11%).
- Government Support not identified as a key strength.

Text Inputs:

Strong Ecosystem: Emergent startups and GENOPOLE highlighted.
Lead Ecosystem: Interdisciplinary collaboration mentioned.
Emerging Ecosystem: Enthusiasm as a strength.

10. *Which of the below collaboration opportunities already exist for start-ups and academic researchers/institutions in your country? Please select the options that apply:*

a. *Joint projects and partnerships with clearly defined intellectual property (IP) ownership and licensing terms.*
b. *Opportunities for knowledge-sharing and exchange through access to research networks and communities.*
c. *Incubator programs that integrate academic research with start-up initiatives.*
d. *Relevant public funding schemes.*
e. *Relevant infrastructure.*
f. *All the above.*

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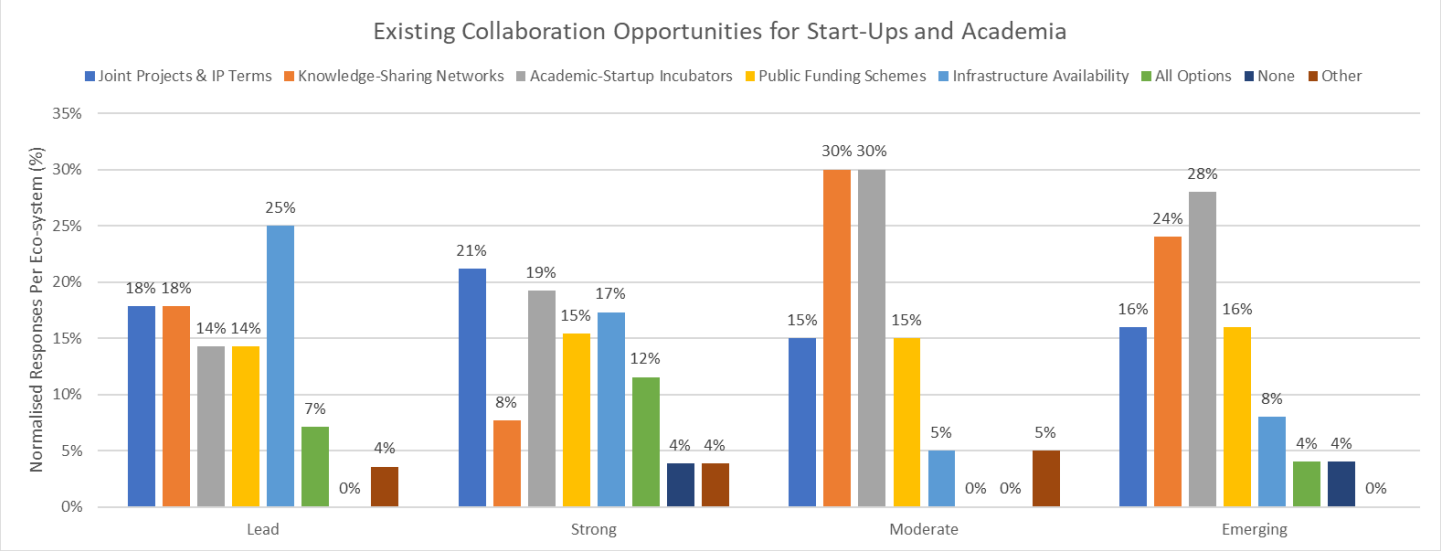
g. None of the above.
h. Other (please specify)



Lead Ecosystem:

- Even distribution of collaboration opportunities.
- Top option: Relevant infrastructure (25%).
- Notable for joint projects with IP terms, knowledge-sharing networks, and academic-startup incubators (18% and 14%).

Strong Ecosystem:

- Emphasis on joint projects with IP terms (21%) and academic-startup incubators (19%).
- Significant mention of public funding schemes (15%) and infrastructure (17%).
- 12% of respondents indicate availability of all collaboration options.

Moderate Ecosystem:

- Strong focus on knowledge-sharing networks and academic-startup incubators (30% each).
- Joint projects with IP terms and public funding schemes also present (15%).
- Less common: Relevant infrastructure (5%).

Emerging Ecosystem:

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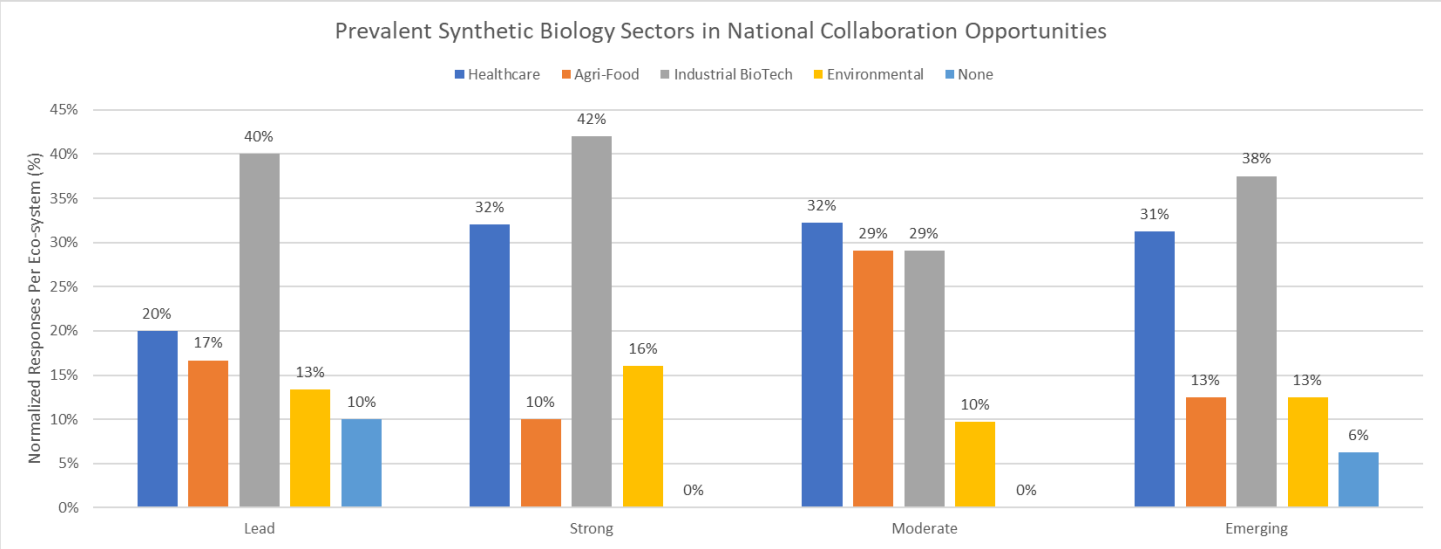
- High emphasis on academic-startup incubators (28%) and knowledge-sharing networks (24%).
- Joint projects with IP terms and public funding schemes noted (16% each).
- Less frequent: Availability of all options (4%).

Common across ecosystems: Academic-startup incubators and knowledge-sharing networks. Joint projects with IP terms and public funding schemes are well-represented. Least common: Availability of all collaboration options, especially in Moderate and Emerging ecosystems.

11. *What areas of the synthetic biology are currently most developed in your country? Please select all that apply:*

a. *Healthcare*
b. *Agriculture and food production*
c. *Industrial biotechnology and manufacturing*
d. *Environmental and sustainability applications*
e. *None of the above*
f. *Other (please specify)*



- Industrial Biotechnology and Manufacturing is the leading area of development across all ecosystems.

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- Healthcare is also a major area of focus, particularly in the Strong, Moderate, and Emerging ecosystems.
- Agriculture and Food Production shows varied levels of development, with Moderate ecosystem showing considerable focus.
- Environmental and Sustainability Applications are somewhat developed across ecosystems but less so compared to other areas.
- None of the Above: Minimal to no respondents in most ecosystems feel that none of these areas are developed.

12. *Have you collaborated with academic institutions in synthetic biology-related activities? Select all that apply.*
    a. *Yes, multiple times on research and development (R&D) projects.*
    b. *Yes, once on an R&D project.*
    c. *Yes, on a spin-off project.*
    d. *Yes, in recruiting Principal Investigators (PIs) for the board.*
    e. *Yes, by regularly hosting interns from academia.*
    f. *Yes, by involving scientific experts on the company board.*
    g. *Yes, by collaborating with academic labs on R&D projects.*
    h. *Yes, by recruiting scientific PIs as a Chief Science Officer (CSO), Chief Technology Officer (CTO), or other team members.*
    i. *Yes, as an academia spin-off with all the above ways of academia involvement*
    j. *No, but I would like to collaborate.*
    k. *No, and I am not interested in doing so.*

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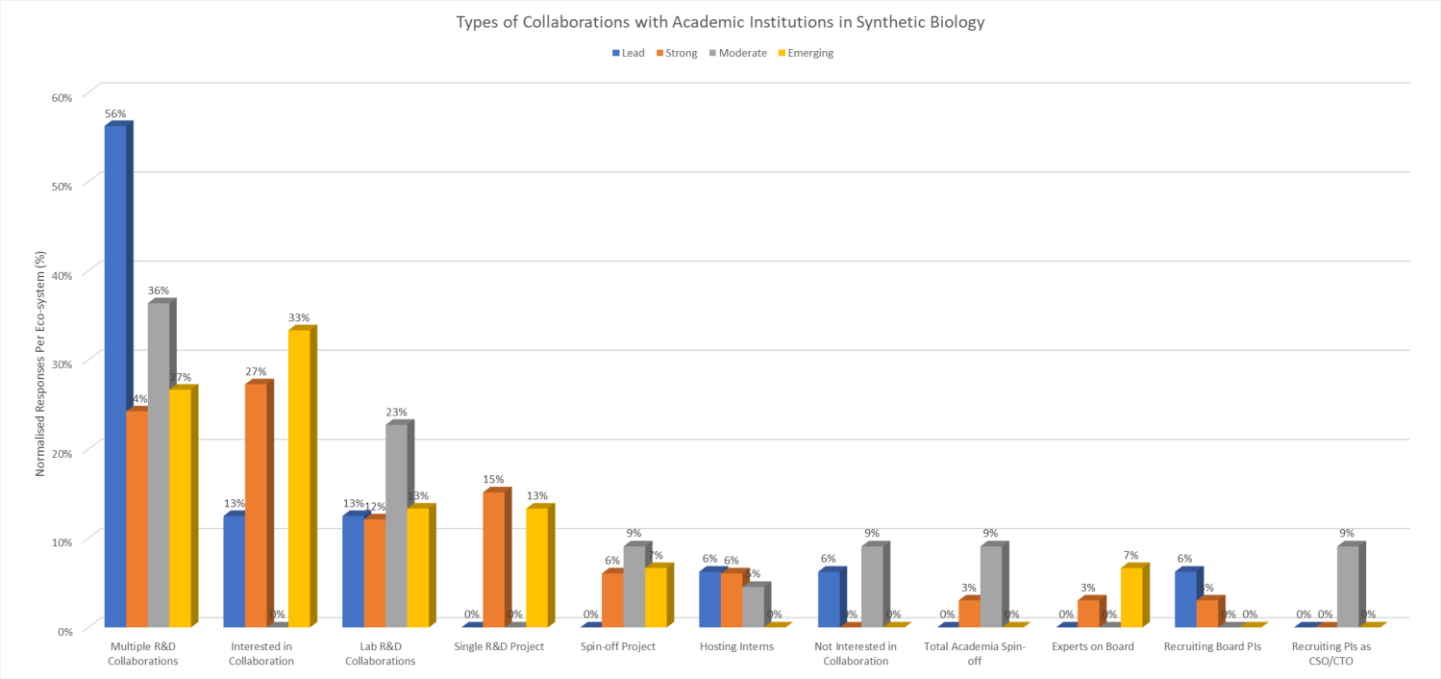

Lead Ecosystem:

- Majority engaged in multiple R&D collaborations (56%).
- Notable involvement in single lab R&D collaborations and recruiting PIs for the board (13% each).
- Interest in future collaboration present, but lower (6%).

Strong Ecosystem:

- Diverse range of collaborations: 24% in multiple R&D collaborations, 27% interested in future collaboration.
- Significant single R&D project collaborations (15%) and lab R&D collaborations (12%).
- Involvement in spin-off projects and academia spin-offs (6% and 3%).

Moderate Ecosystem:

- High engagement in multiple R&D collaborations (36%) and lab R&D collaborations (23%).
- Interest in spin-off projects (9%) and recruiting PIs as CSO/CTO (9%).
- Some are not interested in collaboration (9%).

Emerging Ecosystem:

- Significant interest in future collaborations (33%) and engagement in multiple R&D collaborations (27%).

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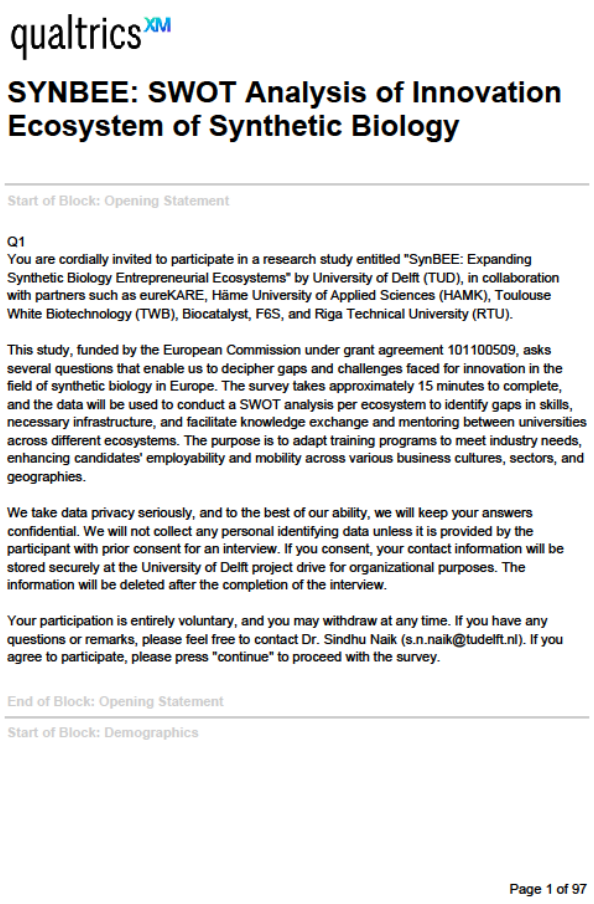
- Balanced involvement in lab R&D collaborations and single R&D projects (13% each).
- Collaboration through scientific experts on the board (7%) and spin-off projects (7%).

Common across ecosystems: Multiple R&D collaborations and interest in future collaborations. Varied engagement in single R&D projects, lab collaborations, and spin-off activities. Notable interest in involving academic expertise in corporate boards and management roles.

7.2 Survey Questionnaire

Double click on the below file to open a PDF version of the online survey questionnaire.



qualtrics XM

SYNBEE: SWOT Analysis of Innovation Ecosystem of Synthetic Biology

Start of Block: Opening Statement

Q1
You are cordially invited to participate in a research study entitled "SynBEE: Expanding Synthetic Biology Entrepreneurial Ecosystems" by University of Delft (TUD), in collaboration with partners such as eureKARE, Häme University of Applied Sciences (HAMK), Toulouse White Biotechnology (TWB), Biocatalyst, F6S, and Riga Technical University (RTU).

This study, funded by the European Commission under grant agreement 101100509, asks several questions that enable us to decipher gaps and challenges faced for innovation in the field of synthetic biology in Europe. The survey takes approximately 15 minutes to complete, and the data will be used to conduct a SWOT analysis per ecosystem to identify gaps in skills, necessary infrastructure, and facilitate knowledge exchange and mentoring between universities across different ecosystems. The purpose is to adapt training programs to meet industry needs, enhancing candidates' employability and mobility across various business cultures, sectors, and geographies.

We take data privacy seriously, and to the best of our ability, we will keep your answers confidential. We will not collect any personal identifying data unless it is provided by the participant with prior consent for an interview. If you consent, your contact information will be stored securely at the University of Delft project drive for organizational purposes. The information will be deleted after the completion of the interview.

Your participation is entirely voluntary, and you may withdraw at any time. If you have any questions or remarks, please feel free to contact Dr. Sindhu Naik (s.n.naik@tudelft.nl). If you agree to participate, please press "continue" to proceed with the survey.

End of Block: Opening Statement

Start of Block: Demographics

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