EIT HEI Initiative

Innovation Capacity Building for Higher Education

European Institute of Innovation & Technology

Funded by the European Union

Training handbook on innovation and entrepreneurship in digital health

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Contents

Executive Summary

The handbook covers learning objectives, learning outcomes, target groups, workshop content and a slide deck attached to this file. This handbook will be made available in the HEI Initiative Resource Hub, accessible to all HEI Initiative consortia. This action relates to Domain 3 (WP3): Contributing to Developing Innovations and Business. The handbook complements other actions taken within the activities of WP3: courses on entrepreneurship and innovation in digital health and competency profile. It also relates to the developed mircrolearnings and podcasts recorded throughout the EIT HEI innovAId project. The learning aids were designed for a broad audience to ensure maximal impact in the institutions. Our workshops included an audience representing the Medical University of Gdańsk, Gdańsk University of Technology, University of Gdańsk and Academy of Fine Arts in Gdańsk. The remaining consortium partners would join the workshops organized by the Medical University of Gdańsk online. The workshops were open to all academic staff, non-academic staff, PhD students, master students and bachelor students. This target group included, amongst others, healthcare/medical professionals, teaching staff, researchers, management and board members.

About the EIT HEI Initiative

The EIT HEI Initiative: Innovation Capacity Building for Higher Education has been designed with the aim of increasing the innovation and entrepreneurial capacity in higher education by bringing together HEIs in innovation value chains and ecosystems across Europe. A central philosophy of the EIT is the integration of the EIT Knowledge Triangle Model into all its activities. HEIs selected to participate in the HEI Initiative will also leverage and use the Knowledge Triangle Model as an enabler, facilitating the creation of systemic, institutional change. Additionally, HEIs selected to participate in the HEI Initiative will contribute to and leverage Smart Specialisation Strategies, the Regional Innovation Impact Assessment (RIIA) Framework, as well as align to the goals of the EIT Regional Innovation Scheme (EIT RIS).

This will strengthen the links between HEIs and their local and regional ecosystems and provide an impetus to leverage additional funding sources beyond the HEI project funding period of the selected HEI projects.

HEIs are encouraged to prepare applications which will support the development and implementation of six Actions in their institutions, cumulatively leading to institutional transformation, an increase in entrepreneurial and innovation capacity, and integration with innovation ecosystems.

1 Introduction to the innovation and entrepreneurship in digital health – educational tools

Innovation stands as the cornerstone of progress in contemporary society. The cultivation of innovative skills is therefore imperative, as individuals equipped with the ability to think creatively, problem-solve effectively, and adapt to changing landscapes become the catalysts for transformative change.

The development of innovative skills transcends traditional didactic methods, necessitating an interdisciplinary and experiential learning approach. By embracing a spectrum of educational activities, ranging from project-based learning, workshops to collaborative problem-solving initiatives and immersive experiences, educators can provide learners with multifaceted opportunities to engage with real-world challenges, explore novel ideas, and harness their creativity.

In addition to active learning methodologies, immersive experiences, such as internships, study abroad programs, and industry partnerships, offer invaluable opportunities for learners to apply their skills in real-world settings, bridge the gap between theory and practice, and gain firsthand exposure to innovative practices and technologies.

In conclusion, the cultivation of innovative skills through diverse educational activities is paramount in preparing learners to thrive in a rapidly evolving world characterized by uncertainty and complexity. Approaches that prioritize experiential learning, collaboration, and real-world application, educators can empower students to become agile problem-solvers, visionary leaders, and catalysts for positive change in their communities and beyond.

1.1 Workshops

Our journey with the EIT HEI innovAId project started with organizing a series of workshops focused on entrepreneurship and innovation in digital health. The events had the main target audience of medicine and biotechnology students, accompanied by the staff of the Medical University of Gdańsk. The topics of the workshops were as follows:

- "Innovation in digital health"
- "Introduction to workshops on innovations in digital health"
- "Entrepreneurship and science in digital health"
- "Examples of innovations in digital health at the Fahrenheit Union"
- "Intellectual property, licenses and spin offs in digital health"
- "Business development in digital health"
- "Successful strategy of commercialization based on effective science and business collaboration"
- "Guidelines to write a business plan: step by step"

These trainings would cover a range of topics critical to entrepreneurial success in digital health, including i.e. market analysis, business model development, regulatory compliance. The workshops provided participants not only with the knowledge, but also the practical skills essential for entrepreneurship. All the workshops' content (e.g. presentations and recordings) would be stored and made available to participants afterwards. Alongside the trainings named above, we also prepared a workshop, "From Clinical Need to Product," in order to show innovAId beneficiaries the path of implementing digital solutions in clinics. The poster which promoted this event is shown below.

Figure 1. Poster "From Clinical Need to Product"

The abovementioned learning opportunities were complemented by the meetings of the Subject Area and Research Team: IV. Artificial intelligence (AI) and big data, headed by dr Anna Supernat: https://research-university.mug.edu.pl/62413.html. Each of the 4 meetings of this research team would gather the scientists of the Medical University of Gdańsk, focused on the application of machine learning in medicine.

Based on the feedback received from students and clinicians, additional trainings were created on innovation and entrepreneurship in artificial intelligence in medicine. Two such trainings on "Lean startup methodology. Artificial intelligence in medicine" were given, one dedicated to students and one dedicated to clinical staff. The latter

meeting, as opposed to all the other events, was held in Polish to allow the comfortable participation of the older hospital staff.

In the meantime, we would also organise a workshop "Advancing Healthcare Through Innovative Technologies" in collaboration with Prof. Beata Schlichtholz (Medical University of Gdańsk) and the National Institute of Standards and Technology (USA). This meeting attracted a very diverse medical community and provided opportunities for experience exchange.

Figure 2. Advancing Healthcare Through Innovative Technologies

The workshops would be further complemented by talks given by Dr Anna Supernat. The presentation entitled "Why molecular biologists need machine learning?" was given during the Biotech Daily event (organized by the Gdańsk Science and Technology Park) and during the study visit focused on building partnerships at the University of Utah (USA).

In depth description of a training (example)

Title of the training: Business development in digital health

Training program description: The program was designed to equip students and staff with the skills and knowledge necessary to thrive in the rapidly evolving digital health sector. The meeting covered essential topics such as market analysis, strategic planning, regulatory landscapes, and innovative business models specific to digital health. Participants could learn how to identify opportunities, create value propositions, and develop effective go-to-market strategies. The meeting took place in a hybrid format.

Training program learning outcomes: Upon completing the workshop, participants improved their capability in navigating the digital health ecosystem, conducting market analysis, and identifying business opportunities. The workshop would equip participants with the skills to drive innovation in product development, implement go-to-market strategies, and adapt to industry changes. Participants could also learn more about leadership and strategic thinking in order to prepare themselves to contribute to business growth and innovation in the digital health sector. The training outcomes were also linked to the EntreComp competencies: a) Vision (Ideas & Opportunities), b) Mobilizing Resources (Resources), c) Planning and Management (Into Action), d) Financial and Economic Literacy (Resources).

Training program assessment methodology and implementation results: We employed pre- and post-workshop evaluations, thoroughly discussing the content to be presented with students and staff. Prior to participation certificate issuing, we would gather participant feedback surveys. For practical project assessments, we tried implementing the gained knowledge during FarU hackathon where students and staff would work on their innovative business ideas. Over the period of 2 years we could observe significant improvement in participants' understanding of market analysis, strategic planning, regulatory compliance, as well as their ability to develop effective go-to-market strategies. All these skills were particularly valuable in the context of testbeds' development at the Medical University of Gdańsk. Overall, the workshop participants reported enhanced confidence and readiness to drive innovation and growth in the digital health sector.

Timeline of development and implementation: We would start organising the workshops from the beginning of the academic year (October 2022). The workshops would be held over the 2 years, on approximately monthly basis. Each workshop would last from 2 up to 6 hours, depending on the content.

Lessons learned & suggestions for improvement: We discovered that sending bulk e-mails (over 1,000 messages) to medical students would not increase participation. Hence, we started contacting student associations for more targeted advertising of our actions. We also mapped staff that might be particularly interested in business development and learned to target them directly. Furthermore, to increase participation, we would organise podcasts to reach a broader audience.

Shared materials for this course:
https://drive.google.com/file/d/1LjGEqXWg6i505jGrwlveH3PrRx59tWu2/view?usp=drive_link

Shared materials of additional aforementioned courses:
https://drive.google.com/drive/folders/1gMB3QtzBkEEnnd1wXtnrqYc3lbbrWp_e?usp=sharing

1.2 Networking events & Expert discussions

Networking events and open meetings with experts serve as a platform for participants to interact with industry, potential investors, and fellow entrepreneurs. These events create opportunities for valuable collaborations, knowledge sharing, and access to a broader support network. They were organized to supplement the trainings described in the previous section.

As we could see that the potential of AI in patient care was not fully utilized, we decided to change it. So, we invited an interdisciplinary group of experts (representing the healthcare system, the medical university, businesses as well as local entrepreneurs) to discuss the most essential issues interrelated with opportunities and potential risks of digital services in healthcare and the conditions of a supportive and stimulating ecosystem for innovators.

This kind of cross-sectional event creates not only the possibility to broaden the knowledge, but also a lot of networking opportunities for scientists and business practitioners, as shown in the multiplier and matchmaking event presented below.

Figure 3. From Data to Wisdom

Link: https://www.youtube.com/watch?v=nU-cpfD9BzA&ab_channel=Gda%C5%84skiUniwersytetMedyczny

Discovering the transformative effect of the panel discussions, dr Anna Supernat would participate in the Oxford debate, organised on behalf of the Student Research Association "Artificial Intelligence in Medicine". The debate was focused on discussing the potential of artificial intelligence to deplete doctors' jobs in the future. The main conclusion of the debate was that while AI can perform some of the tasks currently performed by clinicians, it is unlikely that it will entirely replace the doctors. What we can expect, though, is that the characteristics of their jobs will change with time and be more limited to the supervision of patient management.

Members of the innovAId Medical University of Gdańsk team would also co-organise a hackathon based at Fahrenheit Union composed of Medical University of Gdańsk, University of Gdańsk and Gdańsk University of Technology. We set ourselves similar tasks when implementing the InnovAId project, believing in the power of synergy. This was not our first experience with working in this formula - a few months ago, MUG experts accompanied the participants of the hack4chage hackathon, organized by the CODE:ME Foundation. We aimed at inspiring students to design and implement innovative solutions in the field of health, knowing that digital solutions can have a positive impact on the availability of health services, but their potential is still not fully exploited.

An example of the solution developed over the FarU Hackathon was the "DepressionControlApp", which won the 3rd prize of the FarU Hackathon. The interdisciplinary team was supported in work on the application by Dr. Anna Supernat. This idea was further developed at an IT corporation which agreed to the proposition of Dr Anna Supernat to work on this case in a business surrounding.

1.3 Podcasts

You can also try some modern forms for sharing knowledge and inspiration to supplement traditional trainings. A podcast is a recipient-friendly, effective and accessible form of transmitting information. We spend many hours in front of the screen every single day - podcasts can accompany us during different forms of spending our free time. You can listen to them while exercising, walking, traveling or on the way to work.

Example

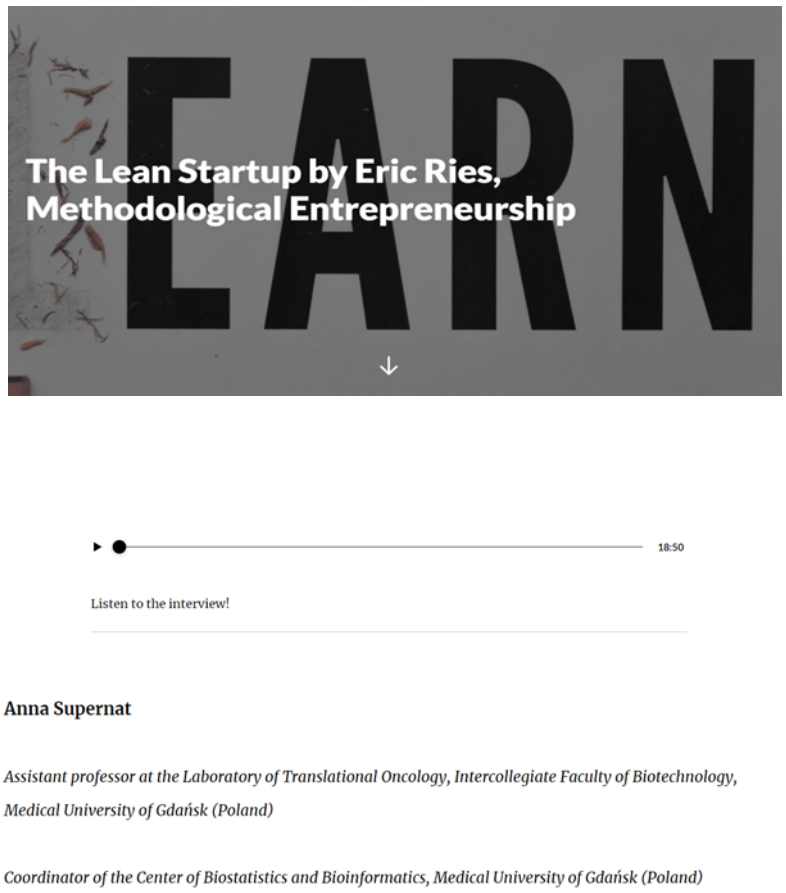

Figure 4. The Lean Startup Podcast

Link: https://rise.articulate.com/share/1b62ylyJY_ozf2HmHFDJvu1L4MNY-x8N#/

1.4 Conclusion

While the original deliverables for this project involved creating traditional trainings in innovation and entrepreneurship in digital health, the team at MUG opted for a multi-media and multi-type approach. This involved a series of workshops/trainings in this field, which were supplemented by panel discussions, podcasts and networking events. We believe that to have a full picture, and to promote knowledge in innovation and entrepreneurship in digital health, all these aspects are necessary in the educational sphere. This training series begun end of 2022 (with preparations starting in the beginning of the academic year), and ended mid 2024, thus taking up almost the entire duration of the 2-year innovAId project.

2 Innovation and entrepreneurship in digital health in practice – exemplary innovator's path in the university institution – case of Technology Transfer Office

To complement the above overview of the trainings provided on innovation and entrepreneurship in digital health, we believe that it is also beneficial to present an exemplary innovator's path within the university context. These insights are based on the case of the Technology Transfer Office (TTO) of the Medical University Gdańsk. This journey can be found below.

Embarking on the journey of entrepreneurship represents a dynamic pathway towards the cultivation and refinement of essential business skills. In today's ever-evolving economic landscape, the ability to innovate, adapt, and navigate complexities is paramount for success. Starting one's own business serves as a fertile ground for honing these skills, offering aspiring entrepreneurs a hands-on education like no other.

Entrepreneurship transcends the confines of traditional learning environments, providing individuals with a platform to translate ideas into tangible ventures, navigate challenges, and capitalize on opportunities. This introductory discourse delves into the transformative power of entrepreneurship as a conduit for developing a diverse array of business skills, from strategic planning and financial management to marketing and leadership.

At its core, entrepreneurship demands a blend of creativity, resilience, and resourcefulness—an amalgamation of skills that are best cultivated through experiential learning. By venturing into the realm of entrepreneurship, individuals are compelled to confront uncertainty, embrace ambiguity, and iterate on their ideas in real-time. Through this process, entrepreneurs acquire invaluable insights into market dynamics, consumer behaviour, and industry trends, fostering a nuanced understanding of business operations and strategies.

Moreover, the entrepreneurial journey serves as a crucible for personal and professional growth, challenging individuals to expand their skill sets, overcome obstacles, and forge innovative solutions to pressing problems. From crafting business plans and securing funding to building teams and fostering customer relationships, entrepreneurs are tasked with a myriad of responsibilities that necessitate agility, adaptability, and effective decision-making.

Furthermore, entrepreneurship cultivates an entrepreneurial mindset—an orientation towards opportunity, risk-taking, and value creation. By encouraging individuals to think critically, act decisively, and persevere in the face of setbacks, entrepreneurship instils a sense of agency and autonomy, empowering individuals to chart their own course and shape their destiny.

In conclusion, entrepreneurship serves as a transformative vehicle for the development of business skills, offering individuals a unique opportunity to learn by doing, fail forward, and ultimately, succeed on their own terms.

Comprehensive support in the path of developing business competences is provided within the university structures by specialized units that operate at the intersection of the world of scientific research and business. At the Medical University of Gdańsk, such a unit is the Technology Transfer Office (TTO). The scope of its activities is very wide and is addressed to both people who want to acquire basic knowledge and those who are at the stage of creating their own business. The following pages will present selected TTO activities that may constitute good practices for other entities of this type.

2.1. About the Office

The Technology Transfer Office (TTO) operates as a university-wide entity and serve as catalysts for bridging the gap between academia and industry, facilitating the seamless transfer of technological advancements from scientific research to practical applications in the industrial sector. By promoting innovation, fostering technology transfer, and spearheading the commercialization of pioneering solutions, TTO plays a pivotal role in driving economic development. Their endeavors not only harness the latent potential of research but also bolster the competitiveness of the economy by transforming ideas into tangible products and services.

2.2. Elevating Entrepreneurial Skills

The Technology Transfer Office is committed to enhancing awareness and competencies within the academic community. TTO's objective is to foster knowledge exchange and experiential learning, fostering collaboration with incubators and technology parks.

Educational activities examples:

- **EIT Health Innovation Days**: These hackathons, organized by the European Institute of Health Innovation and Technology, bring together participants from across Europe, including universities and partner institutions. While previously hosted by the Medical University of Gdańsk, the university now serves as a partner within the EIT Health network.
- **Innovation Days (i-Days):** This initiative unites academia and industry, drawing participants from Tricity universities, start-ups, companies, and entrepreneurship trainers. Teams with diverse skill sets collaborate on interdisciplinary projects, guided by design thinking and pitching workshops. The culminating presentations allow teams to showcase their ideas to a panel of experts, facilitating constructive feedback and networking opportunities.
- **Business Model Workshops:** Technology Transfer Office offers training in crafting business models tailored to medical solutions. Participants acquire practical skills in planning and managing business models, focusing on commercialization and technology transfer. The aim is to empower staff representatives with the expertise needed to navigate the process effectively, including establishing spin-off companies.

- From Scientists to Innovators for Industry (SCI-FI) Initiative: This three-month program includes online modules, seminars, mentoring sessions, and in-person events. Geared towards doctoral students and young researchers, SCI-FI equips participants with the knowledge and skills necessary to pursue careers in industry or collaborate with industry partners. The comprehensive curriculum empowers aspiring innovators to bridge the gap between academia and industry, fostering a culture of innovation and collaboration.
- Website www.tto.mug.edu.pl serves as a pivotal platform for engaging with the academic community, including students, doctoral candidates, staff, associates, and associates, as well as individuals interested in research-to-market transition. Through this portal, TTO showcases inventions with commercial potential and facilitate collaboration by presenting technological offers, a cornerstone in establishing partnerships for commercializing developed solutions. These offers are prominently featured in our "invention database" section, ensuring accessibility to interested parties.
- Blog section is as an invaluable resource, delving into the intricacies of technology brokering, innovation, commercialization prospects, and technology transfer. By elucidating these topics, TTO aims to demystify the process and foster a deeper understanding of the commercial utilization of research outcomes.
- Social media platforms such as Twitter, LinkedIn, and ResearchGate are used to expand the outreach. The power of social media enhances visibility, facilitate knowledge exchange, and foster collaborative opportunities.

2.3. Developing Business Skills

a) Individual Consultations with Experts

The TTO serves as a vital bridge between academia and industry, facilitating the transfer and commercialization of research findings. However, it's crucial to recognize that nurturing entrepreneurial and innovative skills among the academic community is equally pivotal. This becomes especially pertinent when researchers embark on entrepreneurial endeavors through indirect commercialization routes, such as establishing spin-off companies. In such instances, having a solid grasp of business fundamentals becomes paramount.

Understanding the intricacies of business operations is essential for researchers venturing into entrepreneurship. This knowledge lays the groundwork for effectively managing a business and fosters seamless communication and collaboration with industry stakeholders like pharmaceutical companies, medical device manufacturers, and investment funds. These interactions often arise during negotiations for licensing or selling intellectual property rights (direct commercialization), wherein scientists collaborate closely with TTO representatives.

In response to these needs, TTO offers personalized mentoring for scientists through individual consultations with experts from the Technology Transfer Center. These sessions cover a spectrum of crucial areas, including:

- Identification of Commercial Potential: Assessing the viability of inventions and delineating potential avenues for commercialization.
- Utilization of Targeting Tools: Leveraging tools for precise identification of project recipients and tailoring medical solutions to meet market demands.
- Development of Commercialization Strategies: Crafting comprehensive strategies for commercializing GUMed inventions, encompassing market analysis, competitor evaluation, and strategic positioning.

Through these tailored consultations, scientists receive personalized guidance and support, empowering them to navigate the complexities of entrepreneurship and maximize the commercial impact of their research endeavors.

b) Commercial Potential and Target Markets

To ensure the successful market implementation of new technology, creators must address a pivotal question: Is the proposed solution commercially viable? Experience demonstrates that scientific excellence, while valuable, doesn't always align with user expectations. Inventions characterized by high scientific merit, often backed by patents, may lack attractiveness or relevance to potential users. Moreover, users' expectations may diverge from scientific hypotheses.

The success of commercialized inventions often hinges not solely on scientific excellence but on the effective utilization of innovation to enhance products and gain competitive advantages over rivals. Precisely identifying the profile of potential customers significantly mitigates project risks. Adjusting ongoing research and development endeavors to meet customer needs yields solutions that better align with market demands, thus enhancing the likelihood of widespread adoption.

It's essential to delineate between end-users and payers when defining customer profiles. The needs of patients, payers (e.g., hospitals), and practitioners may differ significantly, necessitating tailored approaches for each group. Setting goals for solution commercialization underscores the complexity of the process, posing challenges even for experienced teams.

Investigating market demand during the solution's conceptualization stage is imperative to manage project risks effectively. Methodologies such as the Value Proposition Canvas (VPC) offer valuable insights. This tool enables project teams to define target customer profiles and delve into their needs, crafting value propositions that address customer concerns and offer competitive advantages.

The VPC's versatility and accessibility make it suitable for adoption by scientific teams lacking business expertise. Integrating VPC into research teams' daily workflows can enhance their analytical capabilities and align their efforts with market demands.

Another invaluable tool for designing solutions tailored to economic needs is design thinking. This structured approach fosters the creation of innovative, user-centric solutions through observation, collaboration, rapid learning, prototyping, and feedback gathering. A diverse, interdisciplinary team is vital for this process, as experts from various domains offer unique perspectives and contribute to effective solution development.

c) Commercialization Strategy

The notion of a business model emerged in the 1960s but gained widespread recognition around 2000 with the rapid advancement of telecommunications and information technology. Today, it's a staple term in business, with tools for creating and evaluating business models extending far beyond their original applications.

2.4. Forms of Commercialization

Within the framework of a university, commercialization embodies the transition of scientific endeavors into marketable entities. At the MUG, this transformative process is overseen by both the TTO and MUG's dedicated entity, the CIM. Two primary routes emerge when considering commercialization avenues within the university: indirect commercialization (spin-off or spin-out) and direct commercialization (sale or license).

a) Indirect Commercialization (Spin-off or Spin-out)

Indirect commercialization involves the creation of new entities, commonly referred to as spin-offs or spin-outs, which leverage research findings or innovations developed within the university. These entities are typically initiated by faculty members, researchers, or students and operate autonomously, with the university often retaining a vested interest.

In practice, this approach entails the establishment of spin-off or spin-out companies by researchers or innovators to commercialize technologies developed within the university.

These companies, comprising spin-offs and spin-outs, differ in their level of association with the university. A spin-off is typically founded by university-affiliated individuals, such as researchers, PhD students, or students, and maintains organizational, legal, financial, or infrastructural ties with the parent institution. These ties often necessitate the establishment of a licensing agreement between the company and the university, detailing the terms for the utilization and further development of university-developed technologies.

On the other hand, a spin-out is established by university personnel or students with minimal or no direct ties to the parent institution, operating independently across organizational, legal, financial, or infrastructural realms. While spin-outs may lack direct capital or personal connections to the university, collaborative relationships are often fostered on a fair and impartial basis. Although distinguishing between spin-off and spin-out companies can be challenging, both represent promising avenues for successfully implementing innovative technologies developed by scientific researchers.

b) Direct Commercialization (Sale or License)

On the other hand, direct commercialization entails the direct transfer of intellectual property rights to external entities through either sale or licensing agreements. This approach allows for the immediate monetization of

research outcomes, enabling external parties to leverage and further develop the innovations for commercial purposes.

By delineating between these pathways, the university can effectively navigate the complexities of commercialization, ensuring that research breakthroughs are successfully translated into tangible societal benefits.

In practical terms, direct commercialization involves the transfer or utilization of university-generated intellectual property to external entities. Through sale contracts, the university relinquishes full rights to the purchaser, whereas license agreements grant specific entities the authority to utilize the technology under predefined terms and duration. Activities pertaining to direct commercialization, including engagement with interested companies, negotiation of agreements, and contract finalization, are managed by the dedicated team at MUG's Technology Transfer Office.

Choosing the appropriate direct commercialization approach necessitates careful consideration of various factors, weighing the benefits for the university, creators, and the further advancement of the innovation. A fundamental distinction between sale and licensing lies in the retention of rights; while a sale entails complete transfer, a license restricts rights to the specified extent outlined in the agreement. Financially, the decision hinges on whether a one-time lump sum from a sale or regular royalties from licensing prove more advantageous in a given scenario.

Given licensed technologies' diverse nature and readiness level across industries, royalty structures are tailored case by case and subject to negotiation. Crucial elements of the license agreement include payment terms, scope of authorization, rights and obligations of the parties, and agreement duration. Various license agreements exist, ranging from full licenses granting comprehensive rights to limited licenses with narrower usage rights, exclusive agreements prohibiting further licensing, and non-exclusive agreements allowing multiple entities to utilize the technology.

With these considerations in mind, the university, as the licensor, has ample flexibility to strategize market deployment options in alignment with the optimal utilization of the solution.

2.5. Security Procedures

When a scientific team intends to introduce a solution to the market, meticulous planning regarding the publication schedule of the invention's essence is essential, starting from the early stages of research. Patents, granted by the patent office, safeguard inventions that are new, exhibit inventive step, and are suitable for industrial application. Central to patentability is the novelty of the invention rigorously assessed by the office against existing knowledge. To preserve patentability, it's imperative to refrain from disclosing invention details, whether through publications, presentations, or social media until the patent application is lodged. The TTO at MUG oversees all aspects of direct commercialization, including engagement with potential partners and negotiating agreements.

A granted patent confers exclusive rights to the owner, permitting them to profit from the invention's practical application. Inventions not previously disclosed may be submitted for patent protection, with the term of protection lasting up to 20 years, contingent upon regular renewal and payment of appropriate fees. The scope of protection

can be tailored to specific territories, ranging from national to global coverage. Patent applications are typically initiated in the country of invention origin, with submissions to the Polish Patent Office in the case of MUG. Essential documentation includes the patent application, invention description, claims, and drawings, with emphasis on accurately defined patent claims specifying the subject matter and protection scope. Following formal and substantive examinations by the office, successful applications result in patent grants, bolstering the invention's market value and attracting investment opportunities.

Securing intellectual property rights enhances eligibility for EU funds and renders projects more appealing to investment and business partners. Patent protection confers exclusive rights, enhancing market value and offering avenues for trading, selling, or licensing the invention to interested entities.

Having team members proficient in business model creation is essential for formulating a robust commercialization strategy for developed inventions. A well-crafted strategy rooted in the right business model significantly enhances project success rates. Possessing theoretical and practical business acumen is paramount for establishing spin-off companies. This knowledge also fosters effective communication and collaboration with industry stakeholders such as pharmaceutical firms, medical device manufacturers, and investment funds, which are crucial for licensing or selling intellectual property rights (direct commercialization), where scientists may engage alongside CTT representatives.

Regardless of the methodology used, all business models share core elements focusing on:

- Articulating the Value Proposition: Clearly defining the offering's value to the target market.

- Defining the Target Market Segment: Identifying the specific audience for the offering.

- Presenting Revenue Generation Mechanisms: Outlining how the offering will generate revenue and why the audience will be interested.

- Defining the Value Chain Structure: Identifying the resources and processes needed to create and distribute the offering and support its position in the value network.

A structured business model facilitates risk management in the commercialization process by guiding decision-making and assessing potential outcomes. It estimates the probability of specific outcomes and evaluates potential losses if objectives aren't met. Developing a business model is among the initial steps once market implementation activities commence.

Two widely used methods for creating business models are the Business Model Canvas and Lean Canvas. The Business Model Canvas, pioneered by A. Osterwalder, is a universal tool adaptable at any project stage. The Lean Canvas, introduced by A. Muray, focuses on problem-solving and solution delivery, making it ideal for early-stage project development, particularly in academia (https://www.leanfoundry.com/tools/lean-canvas).

While a business model sets the foundation, a commercialization strategy delves into greater detail, outlining specific activities needed to achieve business objectives. It's crucial to note that a business model is not a business plan but an integral component thereof, providing the framework essential for business plan development.

2.6. Securing Funding for Innovation Development

Innovations emerging from university research often find themselves at the nascent stages of technological advancement. Thus, advancing them towards market readiness entails navigating a multifaceted and often resource-intensive journey. This process unfolds several pivotal stages, each demanding careful attention and adequate financial backing.

The journey commences with the culmination of research, where certain findings exhibit promising potential for real-world application. Subsequently, securing intellectual property rights through patent protection becomes paramount. This shields the innovation from unauthorized use and facilitates its dissemination through publication in scientific journals and presentation at conferences without compromising ownership.

Following this, the focus shifts to the crucial phases of prototyping and validation, pivotal steps in demonstrating the practical viability of the technology. However, these developmental milestones invariably entail substantial financial investment.

Acquiring funding to support these stages poses a formidable challenge. Still, avenues for securing financial backing do exist and warrant exploration:

- Government Grants and Funding Programs: Government bodies often offer grants and funding programs specifically tailored to support research and innovation initiatives. These grants can provide significant financial support for various stages of technology development.
- Corporate Partnerships and Collaboration: Collaborating with industry partners or securing strategic partnerships with established companies can provide access to resources, expertise, and funding necessary for further innovation development.
- Venture Capital and Angel Investors: Venture capital firms and angel investors actively seek out promising innovations to invest in. Pitching your innovation to these investors may secure the capital needed to advance your technology to the next stage.
- Crowdfunding Platforms: Crowdfunding platforms offer an alternative avenue for raising funds, allowing innovators to showcase their projects to a broader audience and garner support from individual backers.
- Technology Transfer Offices and Incubators: University-affiliated technology transfer offices and startup incubators often offer support and resources to help researchers navigate the funding landscape, guiding grant applications, investor pitches, and strategic partnerships.

Navigating the funding landscape for innovation development requires persistence, strategic planning, and effective communication of the innovation's value proposition. By leveraging a combination of these funding sources and resources, innovators can overcome financial barriers and accelerate the journey towards market implementation.

a) Incubator and Pre-Accelerator Programs

Tailoring funding opportunities to the developmental stage of technology is crucial for academic entrepreneurs navigating the path from research to market implementation. For technologies originating from the Medical University of Gdańsk, researchers can tap into incubator and pre-accelerator programs designed to provide targeted support at various stages of development:

- Incubator Programs: These initiatives are tailored for researchers whose innovations hold promise for market implementation. Under the umbrella of an incubator program, researchers can access funding to support research and development activities and pre-implementation efforts to enhance the market potential of ongoing research endeavors. This may encompass a spectrum of activities, including laboratory work, research services, procurement of materials, prototype development, expert consultations, and patent protection costs.
- Pre-Accelerator Programs: Targeted at research teams, pre-accelerator programs serve as a precursor to participation in full-fledged accelerator programs. While accelerators typically cater to startups and entrepreneurs, pre-accelerator programs extend support to research teams seeking to expedite project development, secure investors, and penetrate the market. The primary objectives of pre-acceleration programs include:

TTO at MUG provides:

- Training and Workshops: Participants engage in workshops covering essential business domains such as management, strategy, marketing, and finance. These sessions equip teams with the knowledge and skills to navigate the entrepreneurial landscape.
- Mentorship: Seasoned mentors and experts guide candidates, aiding in refining ideas and skill development. This mentorship fosters personal and professional growth, enhancing the prospects of project success.
- Document Preparation: Teams receive assistance crafting essential documents like business plans, pitch decks, and marketing strategies. These documents serve as foundational assets in attracting prospective investors and stakeholders.
- Networking: Networking opportunities facilitate connections with fellow entrepreneurs, potential investors, and strategic partners. These connections are pivotal in expanding the project's reach and unlocking growth opportunities.

- Idea Evaluation: Rigorous evaluation processes help participants assess the viability of their business ideas and align them with market demands. This critical analysis ensures that projects are strategically positioned for success.

Pre-accelerator programs typically span several weeks to months, offering comprehensive support to participants as they prepare for subsequent engagement with accelerator programs. Culminating in events like "demo days," where participants showcase their projects to investors, these programs set the stage for continued business development and growth. Through these initiatives, academic entrepreneurs at the Medical University of Gdańsk gain invaluable resources and support to propel their innovations towards commercial success.

b) Securing External Funding for Project Development

Academics embarking on the journey of innovation often require external funding to propel their projects forward. The Medical University of Gdańsk encourages researchers to explore various avenues of financial support tailored to the developmental stage of their technology. Here are some external funding sources that academics can leverage:

- Government Grants and Research Foundations
    - National Center for Research and Development (NCBR): Offers funding for innovative projects with commercialization potential.
    - Foundation for Polish Science: Provides support for groundbreaking scientific research and technological advancements.
    - Horizon Europe and EIT Health: International programs offering funding for research, innovation, and technology transfer projects.
- Incubator and Pre-Accelerator Programs
    - Startup Incubators: Programs designed to nurture early-stage startups by providing resources, mentorship, and funding.
    - Pre-Accelerator Programs: Prepares research teams for participation in accelerator programs, offering training, mentorship, and networking opportunities.
- Accelerator Programs
    - Focused Development Programs: Accelerators offer structured programs to accelerate startup growth, including mentoring, funding, and networking.
    - Seed Capital and Investment: Some accelerators provide seed funding in exchange for equity, facilitating initial capital for product development.
- Business Angels and Corporate Investors

- Business Angels: Private individuals investing personal funds in high-potential startups, offering capital and industry expertise.
- Corporate Venture Capital: Large companies investing in early-stage projects to gain insights into new technologies and market concepts.

2.7. Innovation implementation

The composition of a project team holds the key to success in bringing innovations to market. When discussing with potential partners or investors, one of the first inquiries often revolves around the team behind the project. Even at early developmental stages, investors seek insights into the leadership and potential for collaboration. While the project's scientific aspects are essential, investors also scrutinize the team's development plans and their capacity for future business endeavors.

It's important to acknowledge that only some scientists possess innate business acumen. In such cases, recognizing the necessity of sourcing these competencies from other team members or collaborating with external experts becomes paramount. Effective leadership entails assigning roles based on individuals' capabilities and enthusiasm rather than academic credentials or seniority. While scientific prowess is invaluable, a team member's commitment and availability are equally crucial. Sometimes , the most decorated scientist may have limited time to dedicate to the project, making it prudent to delegate responsibilities to more available team members.

Adapting to the diverse stages of project development, tasks can be categorized into two primary activities:

- Idea Validation and Development: Involves predominantly scientific team members, potential collaboration with technical universities, and consultations with industry representatives (TRL 1-4).
- Market Implementation: Involves assembling a founding team to initiate startup development (TRL 7-9), building the company, and scaling the product (TRL 5-9).

Notably, the teams responsible for idea validation (TRL 1-4) and solution implementation (TRL 5-9) need to be more diverse. Transferring responsibilities may be advantageous when existing competencies reach their limits. However, irrespective of the project's developmental stage, all team members must share a comprehensive understanding of the end goal. Moreover, fostering diversity within the team enhances its capabilities and directly correlates with implementation success.

By assembling a multidisciplinary team with a shared vision and complementary skills, academic institutions like ours can effectively navigate the complexities of innovation implementation, driving impactful outcomes in the market.

Seed Funds and Venture Capital

Seed Funds: Specialize in investing in very early-stage startups, providing crucial capital for initial growth and innovation.

Venture Capital: Medium- to long-term equity financing for small and medium-sized enterprises with significant growth potential.

Securing funding for project development is a meticulous process that requires careful planning and preparation. Researchers must craft compelling business plans and presentations to attract potential investors or funding institutions. It's essential to match the developmental stage of the technology with the appropriate funding source and persevere through the fundraising challenges . With determination and strategic foresight, academics at the MUG can navigate the funding landscape to advance their innovative projects toward successful commercialization.

2.8. Network - Science-Business Communication

The seamless transition from scientific breakthroughs to commercial success hinges on robust communication between academia and the business sphere. Within this dynamic landscape, TTOs serve as vital conduits, advocating for scientific achievements while representing the interests of academic institutions. Facilitating direct engagements between scientific teams and business stakeholders, such as entrepreneurs, investment funds, and industry giants, underscores our commitment to fostering collaboration, innovation, and translating academic research into tangible business outcomes.

Here are several strategies to optimize preparation for meetings with business stakeholders:

Emphasize Business Value

When engaging with business stakeholders, scientists must underscore the commercial viability of their research. Articulating how research outcomes can deliver tangible business benefits by addressing specific economic and societal challenges is paramount. Presenting research results in the context of potential real-world benefits enhances the perceived value of collaboration opportunities.

Speak Their Language

Business discussions operate within a distinct context and language compared to academic discourse. Hence, it's imperative to communicate research findings clearly and concisely, avoiding jargon and technical complexities. Simplifying scientific concepts ensures that potential partners grasp the value proposition effectively, facilitating meaningful dialogue and alignment of objectives.

Foster Trust and Alignment

Building trust requires mutual understanding of each party's needs and objectives. Engaging in open and transparent dialogue fosters a shared understanding of mutual goals, paving the way for fruitful collaboration. Establishing common ground and aligning interests strengthens partnerships and enhances the likelihood of successful outcomes.

Assess Risk and Scalability

Entrepreneurs prioritize scalability when evaluating the commercial potential of an innovation. Consequently, it's essential to anticipate and address potential limitations, risks, and implementation costs associated with the proposed solution. Proactively analyzing and mitigating risks demonstrates preparedness and instills confidence in potential partners.

Embrace Collaboration

Synergistic outcomes often result from collaborative research endeavors between scientists and industry partners. By leveraging complementary expertise and resources, joint projects expedite commercialization and enhance market readiness. A willingness to collaborate fosters the formation of multidisciplinary teams, bridging the gap between scientific excellence and business acumen. By adopting these strategies, we fortify our communication capacity, forge strategic partnerships, and propel innovative solutions from the laboratory to the marketplace, driving societal impact and economic growth.

References

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