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NAVIC–20 years of a lean management model for wine business R&D

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Abstract. Innovation plays a crucial role in maintaining a company's competitive edge and increasing profitability. However, many wine companies face challenges in convincing practitioners that research enhances competitive advantage and drives financial success. In today's globalized wine industry, sustained and enhanced investment in research has become essential for commercial success. Many companies address this challenge by outsourcing scientific expertise to universities, research institutes, or private researchers. Unfortunately, this often leads to misalignment with the company's goals and strategies. This paper presents a lean model for research management, successfully implemented in a wine company for over 20 years. The NAVIC (Networking, Agility, Visibility, Intelligence, Creativity) model focuses on aligning research activities with company needs and transforming knowledge into value through innovation. It protects scientific outputs that provide competitive advantages, while openly sharing other findings through dissemination activities. The model emphasizes co-creation, co-development, and business traction strategies to effectively leverage R&D in the wine industry. As results, more than 100 scientific documents were published, and an invitation was addressed to join and coordinate the OIV enterprise consortium.

1. Introduction

Considering that innovation supports a company's competitive advantage and drive higher profits [1], a key challenge of wine companies is getting practitioners to understand that innovation-related wine research increases the likelihood of competitive advantage, bringing financial success. A continued and enhanced investment in research is, thus, a prerequisite for commercial success in today's globalized and competitive wine industry [2].

Yet, while more recently the vocation of companies in society has evolved beyond the mere generation of shareholder value [3] their main role is still not to produce knowledge but to produce value for all stakeholders through generation of profit [4]. In this way, a full-blown investment in scientific research, fundamental or applied is beyond the scope of most wine enterprises, and often beyond the reach of small and medium ones.

Often, most companies solve this challenge by outsourcing its scientific knowledge acquisition to specialized organizations, such as universities, research institutes, or private researchers. Yet, this often comes ill- aligned with a company's goals and strategies, as the funding of those institutions being mostly public, their strategies, agendas and goals do not always coincide with solving commercial challenges, optimizing production processes or grabbing business opportunities. The misalignment of scientific publication requirements facing researchers and the private sector mission to generate profit can be a difficult hurdle to overcome when outsourcing [5].

In this paper, we describe a lean model [6] for research management in a wine company that has been successfully applied in practice for more than 20 years. Outcomes of the model application led to international recognition by the scientific community and an invitation to be among the first to integrate and coordinate the OIV enterprise consortium.

2. Business research management models

Management models for research in business organizations are structured approaches designed to align research activities with the strategic goals and objectives of the company. These frameworks ensure that investments in research translate into concrete business results, such as fostering innovation, securing a competitive edge, and enhancing financial performance. A variety of these models and methods have been developed and are in use across different industries.

These models and approaches provide structured methodologies for managing research in business settings, ensuring that scientific efforts contribute meaningfully to the company's strategic and operational goals. Examples of management models are stage-gate, open innovation, agile, research centre, lean, co-creation [7-11] and, collaborative.

2.1. Models found in wine companies

Across most of the wine producing countries the preferred model has been the collaborative one [12-15]. Overall, the collaborative model is favoured due to its efficiency in addressing the complex and specialized needs of the wine industry without the high costs associated with in-house research facilities. Still, some wine companies understood and adopted other models, often because of specific characteristics (dimension, incumbency, specialization). For example, the research centre model has been adopted by large incumbent companies such as Viña Concha y Toro (Centro de Investigación y Innovación, Chile), Bodega Catena Zapata (Catena Institute of Wine, Argentina) or Moët- Hennessy (Centre de Recherche Robert-Jean De Vogüé, France). Co-creation models have also been episodically applied [16-17].

3. The NAVIC model

Sogrape is a family-owned large wine company with an 82-year track record of successfully producing and marketing a wide and diverse portfolio of quality wines from 5 countries. It is a vertically integrated company farming own vineyards, transforming own and purchased grapes into wines, engaging in distribution and retail and developing wine-tourism. In 2003, an internal research and development department was setup with a clear mission to convert knowledge into value by fuelling efficiency, resilience, and innovation across the whole value chain. The complexity of the company's operation across multiple appellations to produce a wide portfolio of brands and cater to a vast consumer base led to the development of a singular research model inspired by a lean management approach. The model (Figure 1) baptized as NAVIC (Networking, Agility, Visibility, Intelligence, Creativity) is supported by a comprehensive organization of internal and external knowledge from multiple sources which is then integrated into a dedicated database accessible to all collaborators. Any challenge from stakeholders is, in a first step, checked against that database for existing solutions. When an answer cannot be found in the literature organized in the knowledge database, the challenge will follow an ideation pathway to develop a solution.

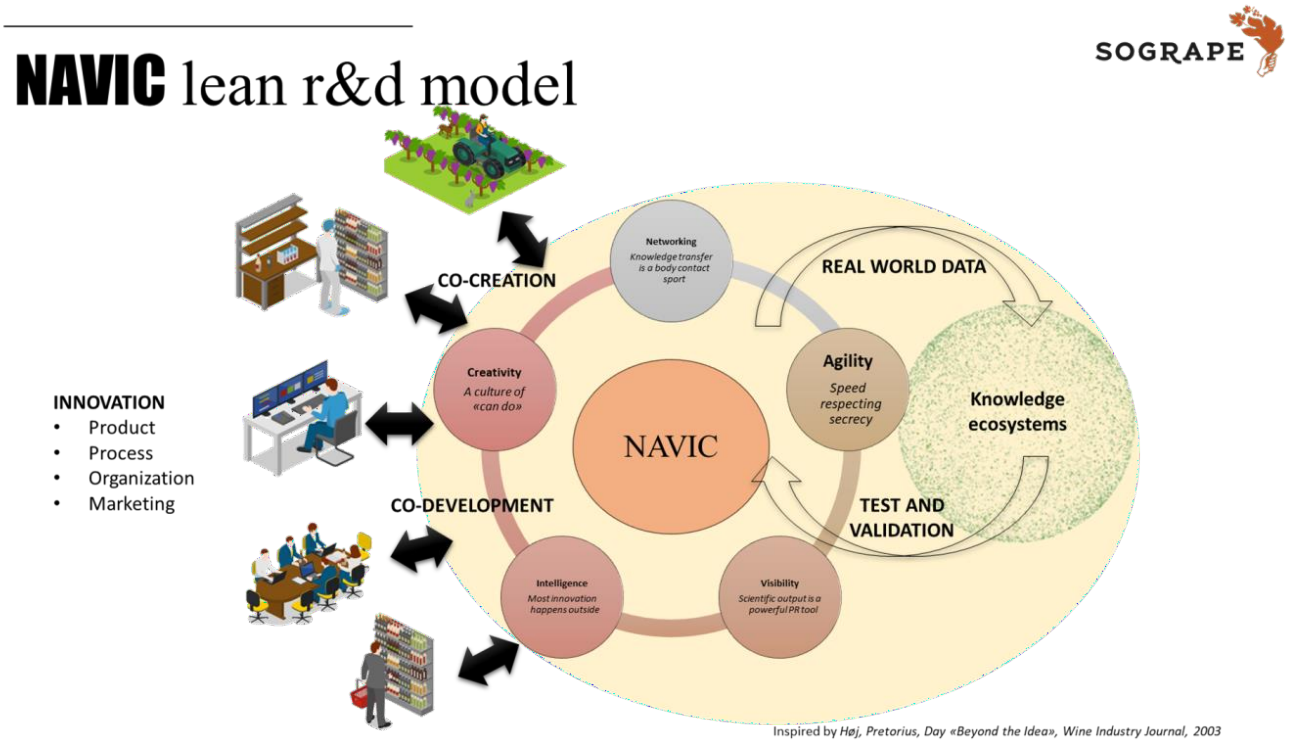

Figure 1. NAVIC model for lean management of business R&D teams.

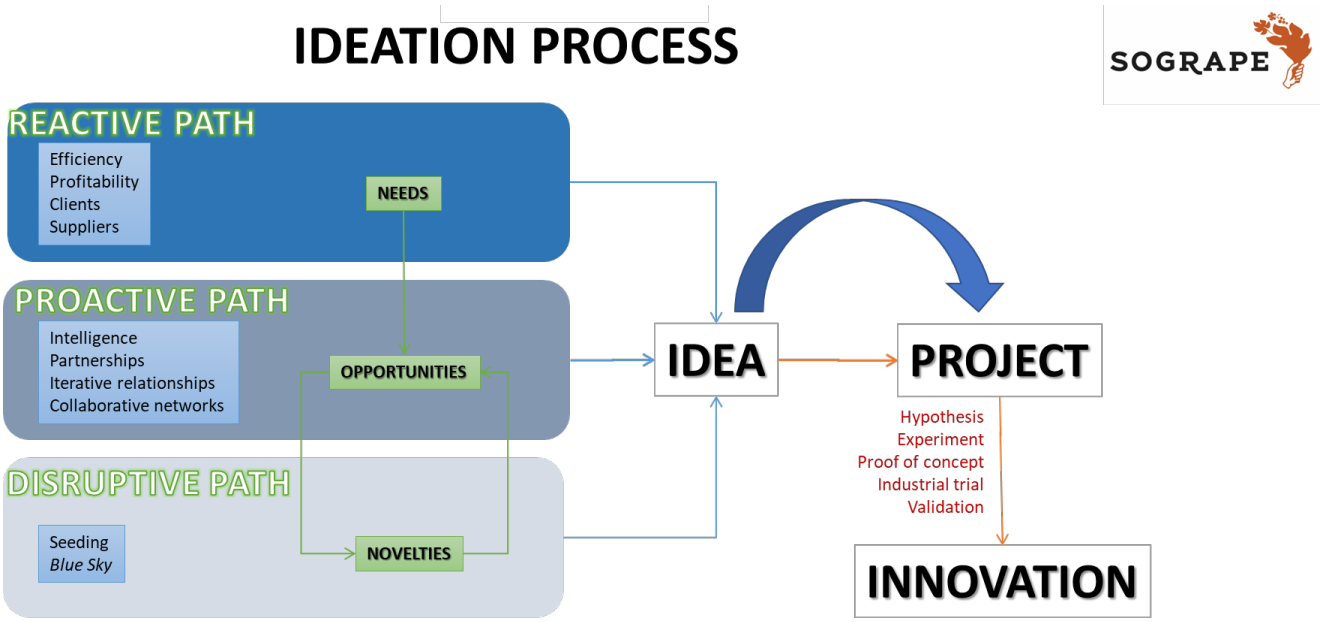

Figure 2. NAVIC ideation pathways.

3.1. Ideation pathways

The NAVIC model manages three different ideation pathways (Figure 2). The reactive pathway is straightforward and usually results from the continuous company drive for efficiency, resulting mostly from interactions with upstream and downstream value chain stakeholders. The usual output of the reactive pathway is the identification of a «need», a problem requiring a solution. The proactive pathway has a more complex and diffuse framework. It results primarily from intelligence routines and interactions with a knowledge ecosystem woven through different types of interactions and iterations with multiple counterparts (associations, regulators, networks). The usual output of the proactive pathway is the recognition of an «opportunity», a possibility of doing something better. An example of a recent «opportunity» was the possibility of using grape pomace extracts to develop prophylactic treatments for chronic foot ulcers from diabetes mellitus patients [18]. The disruptive pathway develops over a more long-term timescale. It consists mostly of *seeding* (multi-actor facilitation for sharing and co-creation of business-related knowledge [19]) and *blue-sky* (research of fundamental pathways within the management model obeys five fundamental principles as detailed below.

3.2. Networking

Knowledge-transfer is a body-contact sport [2]. Wine science is a confluence of knowledge from many different areas finding application in the vastly complex natural phenomena with no immediate application [20]) activities jointly conducted with research providers or innovation actors, including fast moving startup companies across multiple sectors and disciplines. It requires a high-level of trust and rather creative teamwork that may span over months or even years. The output of the disruptive pathway is the creation of a «novelty», a fundamental change opening new possibilities. An example of a «novelty« was the early development of satellite, airplane and drone-based sensors to evaluate the vegetation of grapevines in viticultural and oenological management and contributing for the successful development of high-value commercial services under co-creation and business traction strategies [21-22]. «Needs» and «novelties» may morph into «opportunities», the latter also being possible to become «novelties» The outputs of all three ideation pathways will formulate an idea which, if deemed to be of value, will give birth to a research project. All ideas are organized in a dedicated repository. The project, if successful, shall result in innovation. Additionally, projects generate new knowledge, and, in many cases, new internal capacities. Knowledge is integrated in the internal database while capacities, when relevant, will generate services to be offered internally in support of company processes or monetized externally for interested stakeholders. All projects are managed as individual processes, assigned acronyms for easy reference, and documented from ideation through execution until adoption or *post-mortem*. The functioning of the ideation systems of grape and wine production. In this way, it is of fundamental importance to ensure that at all moments the company's research team knows the right people to bring the right insights to the right challenges. In the NAVIC model, an extensive ecosystem of scientists across multiple subjects and, often, geographically distant is managed as a critical resource of the business setting. Opportunities and novelties arise from iterations with this ecosystem, so it is of the utmost importance to foster moments of contact and exchange. Fortunately, wine being an element of social conviviality, the subject of research offers multiple opportunities for engaging and establishing lasting relationships. Examples of such relationships are the Oenoviti International Network (oenoviti.com), a network of more than 70 academic and business partners and, the OIV enterprise consortium [23].

3.3. Agility

The business of wine is dynamic and fast-paced [24]. Today, the speed of change, pushed by the climatic crisis, globalized markets, changing consumption habits, volatile geopolitics, and a never-ending thread of scientific and technological development, attained levels that are hardly compatible with the necessary time and reflection so important in scientific developments. In the NAVIC model, the capacity of a company's research team to permanently align the flood of knowledge, insights and ideas with fast moving business strategic goals is a major factor contributing to value generation, mainly when intellectual property is adequately protected (industrial secrets, patents, publications). Yet, many applications of scientific knowledge are not possible to protect or keep secret. The velocity of adopting and streamlining those is a major generator of competitive advantage but it entails a temptation to lead business research away from fundamental research and just devote resources to applied experimental development. The model proposes there is an agility sweet spot in being able to maintain an adequate balance between both in a way to avoid that disruptive ideation is obliterated by overuse of the reactive pathway.

3.4. Visibility

Wine science presents a conundrum in terms of perception by consumers and the wider society. Wine being a traditional product, it is often presumed to be impervious to technology or scientific breakthrough. Yet, strong interdisciplinarity in science is a major contributor for high interest among non-academic audiences [25] and wine is a field where many different scientific fields find space for collaboration. On the other hand, business research in the wine sector remains scarce and not very visible even for the academic sector [26]. The NAVIC model lends great importance to visibility of the company's research. Regular publication of research activities is pursued targetting both lay and scientific audiences. By communicating research efforts and results to consumers and decision makers, awareness is raised to the present sophistication of grape and wine production

while publishing results in peer-reviewed scientific journals mitigates conflict between scientific claims and existing industry knowledge by making context explicit. This places science among local knowledges rather than outside and above them [27] and brings together both scientists and practitioners to level-field, trustworthy collaboration.

3.5. Intelligence

The recognition that most innovation happens outside of the company and frequently off-shore is one of the most important elements of smart-science. Tapping this global pool of knowledge is a most effective way of ensuring returns from R&D investments [2]. In the NAVIC model, permanent routines for identifying, recovering, organizing and indexing third-party scientific work are the cornerstone of research management. No experiments needs to be done if someone did it before and made results public. The global reach of this task seemed daunting at first but tools abound that make it feasible even for those with little resources. The first step is a strict discipline to never engage in experimental work before making a comprehensive knowledge review. For scientists this is a given but in corporate environments, too often the correct execution of the scientific method is regarded as a needless loss of time. It is always good practice to keep a separate, well indexed, library of physical and digital scientific works versing on the subjects of grape and wine production. The periodic updating with new publications is a surefire way of keeping good awareness of who is doing what across the world and what are the topics trending most across the wine sector. Many digital tools can be used to support intelligence but they require critical evaluation and a rational, systemic approach. Scientific search engines like Google Scholar (scholar.google.pt), Zenodo (zenodo.org), Semantic Scholar (semanticscholar.org) are some of the most popular. Regular participation in scientific events and engaging with fellow researchers personally or online goes a long way to obtain a good picture of where the most relevant knowledge is coming from at any moment. Social media ubiquity made following developments very easy and almost instantaneous. The growing popularity of open access publishing has made many of the works readily available for everyone. This, however, led to a proliferation of publications and an unavoidable loss of average quality. Intelligence today is, much more than finding and accumulating publications, the capacity of recognizing quality knowledge among the widespread noise while at the same time avoiding to dismiss relevant work from emerging or less visible researchers. Artificial intelligence tools such as ChatGPT (openai.com/chatgpt/) or Perplexity (perplexity.ai) were added to the toolbox but their results required even more scrutiny and critical evaluation as results can be strongly biased, warped or just plainly invented.

3.6. Creativity

Creative thinking can allow restructuring of problems and produce solutions through unexpected insights. Creativity is the root of the innovative thinking that leads to solutions or products that are novel, useful, and critical to economic success [28]. A major factor that limits one's desire to take creative risks in their field is the fear of getting it wrong. Yet, in science and especially research, getting it wrong is just as important as getting it right. Once it is accepted positively as a learning opportunity that the creative idea might not work, it is possible to unleash a whole new potential of creativity and innovation toward solving the company's problems [29]. In the NAVIC model, creativity is fostered by promoting a favourable environment where all ideas from all participants are heard, critically evaluated, and analysed for their potential value, no matter how absurd they may seem at first. The disruptive ideation pathway (see 3.1 above) is the main vehicle for fostering this creative thinking within the team and between the team and the company's stakeholders, upstream and downstream of the research process. In fact, creative thinking is necessary, not just at the stage of building a hypothesis but also at the stage of proposing the adoption of a new solution. To create solutions for current problems, and those not yet encountered, it is fundamental to establish dialogues to bring people together in unconventional ways. Research can only realise its full impact by creating the opportunities for engaging on a personal level between those who conduct it, those who need it, and those who fund it [30]. To obtain this impact the NAVIC model proposes co-creation as a fast lane to seamlessly engage with the ecosystem and boost creative power. The cognitive basis of co-creation is in combining different areas of know-how. The participants of co-creation each bring their own experiences, skills, knowledge, and networks to use. Co-creation means defining and solving problems together. In a co-creation process the researcher identifies the scientific challenges in solving the problem while the practitioner identifies the economic potential. Both parties offer information and know-how to the problem-solving process and participate in both defining and solving the problem in collaboration with one another. The first challenge in establishing successful co- creative work is to achieve trust between the parties, as it is fundamental they walk out of their comfort zone, something that usually requires time and several iterations to achieve [31].

4. Outcomes

The deployment of the NAVIC model in Sogrape led, over the course of 20 years to a critical growth of awareness and confidence in the research process as a booster of economic value, contributing to fuel the company's growth. In 2023, more than 50 collaborators across multiple departments spanning the whole value chain were in one way or another, involved in research projects. Many more engaged with, benefited from and adopted results from R&D activity. The level of R&D investment reached close to 1% of turnover, the highest for any wine company in Portugal.

Many innovations incorporated results from research, from new wines to innovative packaging to wine tourism experiences. Unusual grape varieties and, yeasts isolated from the company's vineyards, were used to create new wines. Experimental viticulture techniques and oenological practices were trialled and implemented with the confidence obtained from the generated data and experience, leading to the adoption of emerging technologies. Generated intellectual property from scientific output was identified and protected adding to the company's assets.

Scientific papers were regularly published, most often in co-authorship from working with the R&D ecosystem, totalling to date more than 100 publications. Every year, new research work and results were presented at scientific events across the world. Yet, the company's research activity has also attracted interest from several mass media with frequent interviews and features being published in newspapers, magazines, radio, podcasts, and TV shows. The research activity framed by the NAVIC model became an additional source of awareness for the company which also reports directly through its website (sogrape.com/research-development).

New processes materialized by the creation of new departments were first developed as a side-stream of R&D and remain firmly engaged with research activities and outputs. These were, for instance, the case of Sustainability (sogrape.com/sustainability), today a department with a dedicated team. Spin-off companies in the group dedicated to wine tourism (winetourism.sogrape.com) and venture investment (ventures.sogrape.com/en) have continued and strong iterations with R&D.

Externally, the NAVIC model allowed the establishment of a continually growing ecosystem of research partners, some maturing into formal long-term collaboration partnerships for fields as diverse as genetics, climatology, sustainable farming, biodiversity, nanotechnology, robotics, biochemistry, microbiology, circular economy. Universities, research institutes, technical associations and many companies regularly pitch Sogrape for partnering in research studies, projects or engaging in creative thinking.

The high-profile achieved by running the NAVIC research model in a leading wine company with operations across the world allow for consequential public affairs activity not just for the company's business but also for the overall wine sector. Positions advocated by the company are fact-checked and supported on the most up-to-date scientific knowledge. Corporate targets and indicators (ex.: reporting on corporate sustainability) are science-based and fuelled by R&D outcomes. As a result, the company is frequently consulted for contributions, either directly or collaboratively through regional, national, and international sectoral institutions. Internationally, besides participating in expert groups of all the four expert commissions of the International Organization for Vine and Wine (OIV), Sogrape participates alongside six other companies in the OIV Enterprise Consortium, a team tasked with assisting in funding, allocating and reviewing research scholarships awarded globally to researchers by the OIV every year.

5. Final considerations and recommendations

The NAVIC model, as reported above, can be a useful tool for consequential wine business R&D and in establishing functional, productive, and mutually beneficial linkages with different stakeholders across the wine value chain and society at large. Yet, a few rules are critical to reap its highest benefits:

Permanently align with the company's business strategy: strategy may change faster than you can finish your research; it is thus critical to ensure R&D is always contributing for the strategy. Periodical formal meetings with senior management facilitate alignment.

Adjust communication to obtain counterpart engagement: speak science to scientists and professional jargon to professionals. Become a translator across seemingly impervious functions or fields and results will flow.

Value and reward good science that deny your expected results: rigorous methodology, sharp analysis and sensible interpretation are the best tools against confirmation or any other biases. Perform *post-mortem* analysis of failed hypothesis and projects and learn fast from mistakes.

Never restrain curiosity but demand accountability: promote new ideas even if far-fetched while ensuring they get critically checked against reality. A business' role is intrinsically very different from an academic environment.

Promote respect for valuable non-scientific, empirical knowledge: field operators are a precious first line of observation into application of new ideas, if their sincerity is gained. It usually pays to show how their observations helped shape research.

Successful business research needs organization for consequence: methodical documentation organized in such a way that any newcomer can catch up quickly with minimum training and keeping updated management KPIs are a basis for lean, efficient management in business R&D.

5.1. For wine business R&D managers adopting NAVIC

Networking: promote informal and frequent communication between team members and between them and other areas of the company. The best way to contribute is by knowing and understanding those holding the needs.

Agility: demand senior management full buy-in allowing for budgetary and operational autonomy within sensible limits, checks and balances. You cannot have an agile response if constrained by micromanagement.

Visibility: align R&D communication with corporate communication. Provide solid science-based support for the company messaging, always, anywhere.

Intelligence: reserve and insist R&D team members also reserve time for reading and web searching. Convert your team into lifetime, professional students.

Creativity: challenge and reward R&D team members for identifying your own flaws and mistakes. Fear is the worst enemy of a creative mind.

5.2. For R&D and knowledge providers engaging with NAVIC-adopting companies

Networking: ask to use company venues for faculty meetings or A2B (academic-to-business) events. Taking researchers to where their science is needed goes a great length is making scientific knowledge valuable.

Agility: monitor the company and sector performance regularly. The ability to engage in research projects or adopt research results depends a lot on the moment and business context.

Visibility: synergize your project communication with the company's. Companies are experts in using communication tools and have a large audience that will be interested in knowing about research impacts in products and services.

Intelligence: establish a schedule of regular meetings with sensible periodicity. Pressing needs and windows of opportunity change fast, so it is wise to keep tabs on what is going on. However, avoid overdoing it as businesses dwindling time availability will constrain their undivided attention.

Creativity: propose cross-disciplinary and / or multi-disciplinary meetings and projects. The wine business is an ideal field of application for cross-fertilized activities. Seek to engage in multi-actor, whole-of-value-chain projects.

5.3. For policymakers wishing to promote NAVIC adoption

Networking: favour actions that bring together businesses and researchers and promote public bilateral exchange of asks and offers. Create *blue-sky* think tanks where the wildest ideas can be exchanged, discussed, and evaluated.

Agility: don't overload collaborative projects with needless bureaucracy, keep it simple and efficient. Offer relevant services from universities and public research centres for enterprises. Fund sabbaticals and secondments of researchers in companies and of professionals in universities, making sure the time frames are compatible with the respective environments.

Visibility: devote resources and budget to dissemination of case studies of successful collaborations between academia and businesses. Make them a matter of social distinction and incentivize young researchers to join such collaborations.

Intelligence: make scientific databases accessible to businesses in the same footing as academic researchers. Foster open access scientific publications. Award competitive funding for scientific events featuring A2B collaborations.

Creativity: create special financial incentives for integrating artists and social scientists in A2B research collaborations. Promote art events for dissemination of scientific work. Invest in artistic literacy for scientists.

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